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THE RATE OF RETURN.

One of the hardest problems for settlement which comes before a public service commission is the determination of the proper rate of return to be allowed upon the investment in the plant or upon its present value, as the case may be. Rates can only be properly adjusted by a knowledge of the value of the property used in any utility service and a recognition of the proper rate of return which this investment should earn.

If the rate of return is too high, it is evident that consumers are paying too much for the services rendered; if the rate of return is too low, additional capital for financing extensions will not be available. There will be dissatisfaction to customers or would-be customers in both cases, and in the latter case there will also be injustice to the investor.

No definite method of determining the proper rate of return has yet been developed by public service commissions. It is generally recognized that the ease of securing capital depends upon the risks involved in the utility, the supply of available capital and other opportunities for investment The aim should be to make the rate of return the same as is earned in other investments where the conditions of risks, etc., are equal. Too often the rate is fixed in an entirely arbitrary way, without a study of the factors which would indicate what the proper rate is.

Some indication as to whether the present earnings of a utility are proper from the standpoint of the regulating body is afforded by the market value of its securities. Even in the case of bonds fully secured by the physical property of the utility we find differences in the market prices, which indicate differences in risk and in the desirability of the investment from the standpoint of the investing public. Since bonds, however, never represent more than a certain fraction of the total investment in a utility and since their desirability is usually judged by the net receipts, they give little indication of the appropriateness of the rate of return upon the entire property. In the case of the capital stock, however, the situation is quite different and the market value of a corporation's stock is usually some measure of proper earnings.

Since there is no definite relation between the amount of outstanding securities and the valuation placed upon a utility property, care must be exercised in applying the market prices of securities to a

judgment of the rate of return. Where the issue of securities has been kept even with investment in the plant and maintenance and depreciation have been properly cared for out of current income, we should expect to find the par value of outstanding stock equal to the difference between the valuation placed upon the property and the value of its bonded indebtedness. Where the latter difference is not equal to the outstanding stock, the ratio of the two may be multiplied by the par value of the stock to obtain a figure which we may call the normal value. The relation of this normal value to market value is under normal conditions an indication as to whether the rate of return has the ideal value, for if the latter is the case we should expect them to be equal. Where the market value is higher than this normal value, correspondingly high earnings are indicated, and where it is lower, it is evident that the returns are not sufficient to encourage new capital.

Of course, such a criterion cannot be applied where conditions do not warrant it, as may often be the case. The market price may be affected by a number of other considerations than the value of the security as an investment, such as the policy of the management in accumulating a surplus; the manipulation of the stock market; the personal relations of large holders of stock or officials of the corporation; the expectation of rate regulation, etc. On the other hand the security in question may be one not listed upon the stock exchanges and one of which there is no public record of sales, or, where sales have been made, the conditions of the sale are such as to indicate that the price is not what would be brought in an open competitive market. When such conditions, however, are given their proper weight and the matter of an analysis is made in the above way, a very good indication may be secured as to whether the rate of return in the past has been suitable.

ELECTRIC POWER FOR FERTILIZER FACTORIES.

The suitability of electric drive for factories manufacturing fertilizers and the progress which has been made in Baltimore in their electrification are well brought out in the article by Mr. F. M. Weller, which was begun last week and is completed in this issue. The energy consumption on the lines of the Consolidated Gas, Electric Light & Power Company, of Baltimore, has increased tenfold in three years, while the connected load has increased nearly four times. This is excellent evidence not only of the effectiveness of the new-business department of the company mentioned, but also of the suitability of electric drive for this purpose and the satisfaction from using central-station supply. Perusal of Mr. Weller's article can leave no doubt as to the possibilities of electrification in this industry and with this evidence before them, central stations in other localities should find it quite possible to add similar plants to their lists of customers.

FIRE HAZARDS OF RADIOTELEGRAPHY.

In view of the somewhat wide discussion of radiotelegraphy in relation to fire hazards appearing in the newspapers of late and a recent governmental order to inspectors of such installations on shipboard, it is gratifying to run across a thoroughly sound popular article on the subject in the *Boston Transcript* of July 18 from the pen of Benjamin Baker, a well-known interpreter of scientific matters to the lay mind. There is probably no branch of electrical engineering which has served the Sunday papers with so much food for imaginative speculation as has radiotelegraphy, and the existence of a slight but positive fire hazard in the use of wireless apparatus on shipboard has been worked for all it is worth. No ship fire has been definitely traced to this source, but experts in this field have become convinced of the importance of preventing any such occurrence, and fortunately this is not a difficult task.

The Washington instructions provide that when inspecting radiotelegraphic plants on board tank steamers, oil boats and all other vessels carrying substances that may give rise to mixtures which can be ignited or exploded by electric sparks, special attention must be paid to the insulation of antennae, supplemented by the examination of metallic contacts, cables, electrical material, and all pieces in which the high-frequency currents of the plant are likely to engender induced currents. If sparks pass, either between two wires, or across joints and air-gaps, the danger must be reported to the commanding officer, to the steamship and wireless telegraph companies. These points may be supplemented by reference to the further possibility of hot-air explosions on vessels already on fire, caused by the ignition of air in explosive mixture with gases, resulting from sparks of the vagrant kind above noted. Remote as the danger appears, it is none the less the part of scientific prudence to apprehend it.

A high-powered radio plant on a vessel easily induces oscillatory currents in the metal stays of masts and funnels, and often in the railings and other conducting material on deck. In a mast stay 100 feet long, as is common on large steamships, this induced current may reach a potential of four or five thousand volts, and if the stays are not amply insulated at the ends, sparking will occur between the ends and adjoining pieces of metal. Thin layers of paint and small cracks of air offer little obstruction to the passage of such sparks. When the radio plant of the ship is in operation, the faint crackle of these sparks can be heard in the neighborhood of the wireless cabin, and at night they can sometimes be seen as minute flashes at various points around the upper deck. Sometimes, when the wire stays of the funnel are imperfectly insulated or when the rope winding of the eyes at the ends is very dry, sparking will occur between the stays and the funnel. This sparking is practically harmless, however, because of the low temperature and open-air exposure, the sole

danger apparently arising from sparks within the ship itself, due in most cases to imperfect grounding of the radio circuit to the hull plates.

In case the discharge has to run along the ship frame and jump a narrow crack between the frame and the plates, it is barely possible that a spark might cause trouble, if the proper explosive mixture of gas and air were present. Sparks from induced currents below decks might occur if metal railings were imperfectly connected with the hull, or if they were actually insulated by some accident of installation, but such an occurrence is extremely unlikely. Wood is probably too slow a combustible to be ignited in any such way and the only real source of fire danger appears to be from gases and hot air which rise in a ship in case of even a slight fire and furnish the materials of trouble. There is certainly nothing more needed on large passenger vessels susceptible to fire risk than the use of automatic sprinklers which will throttle fires when incipient and entirely do away with the danger of hot-air explosions from any cause within human control. When it is considered that throughout the world one steam vessel has been wholly or partly burned daily for the past seven and a half years, it should be clear that sprinklers are nearly as important a protective feature as the wireless itself. With a reasonable degree of care for the condition of grounded circuits, the fire hazard of radiotelegraphy can be reduced to the extreme minimum. The pretty theories of the Sunday papers with respect to the ignition of magazines within vessels by wireless radiations directed from a hostile source may be dismissed with scant consideration in view of the impenetrability of metal plates to such waves.

ELECTRICAL SERVICE AT SUMMER HOTELS.

The increasing use of electricity in middle-class homes in the city is likely to lead to a great improvement in summer-hotel service in the near future, wherever such establishments are within commercial reach of a central station or isolated plant. People accustomed to good lighting at home are becoming critical of the use of the time-honored kerosene lamp or the dangerous acetylene or gasoline system at summer resorts, and the hotel which takes the simpler electrical applications in hand along approved lines of practice will do much toward building up a clientele ready and willing to pay for the superior service rendered. It is no uncommon experience in establishments of the usual kind to find it necessary to shave with cold water and to read by the dim light of a hand lamp; muggy days and nights come, even at the seashore, and the possibilities of the small fan motor, the light flatiron, the milk warmer, heating pad and vibrator are too great to overlook.

In other words, electrical household conveniences have become too much a part of life to be wholly abandoned on vacation, and the central-station man who devotes a little time this summer to figuring the cost and return upon service to hotels within reach may find himself surprised now and then at the results which appear practicable. Low prices for board and rooms are not invariable features of really comfortable summer hotels, and the more the public gets accustomed to using electricity at home, the more ready it will be to pay a slight increase in rates for a standard of resort living a little higher than was previously thought practicable. A campaign against glare, even in many of the so-called best summer hotels, would work wonders. At many shore resorts August is likely to be accompanied by a good deal of foggy weather, necessitating a considerable amount of indoor life, and the establishment which takes a little thought for its guests' comfort along electrical lines will go far toward securing a reputation which will stand it in good stead in coming years. It is not too late to do some such work this season in many establishments now characterized by poor lighting facilities, through the substitution of portable fixtures for the hanging abortions in illumination often found in the centers of chambers. This should be supplemented with a resolve that next season, real comfort shall be given to the house by a carefully arranged, if withal inexpensive electrical installation.

PERFECTING THE INDIVIDUAL DRIVE.

Electrical manufacturers supplying motors for the individual driving of machine tools will do well to perfect such equipment in minor details as well as to see to it that the requisite powering and temperature characteristics are provided. The selling capabilities of a completely equipped tool are sure, to be enhanced by construction features which will meet the severe criticism of the experienced engineer, and a small and apparently unimportant omission, on the other hand, may lead to the rejection of an otherwise satisfactory device. Thus, a recently examined twist-drill grinder driven by a motor located on the machine pedestal had many excellent features. The grinder wheels were mounted on a short horizontal shaft, one on each side of a well-lubricated center bearing, the larger wheel and the tool stand being placed on the opposite side to the motor, so that the stability of the machine, which stood four feet high, was admirable, resulting in an economical use of pedestal stock. The belt drive from the motor pulley was carried upward inside the pedestal to the tool shaft, with a further saving in space. The starting box was mounted on the pedestal above the motor, close by the operator's hand, but the wiring of the machine was run in open leads and the rheostat contacts were exposed to short-circuiting by tools. On this machine, if the wiring had been carried in flexible metal conduit or in iron pipe with the rheostat terminals safeguarded at a trifling increase in cost, the tool drive would have been beyond criticism. A careful study of motor drives will disclose many such opportunities for improvement.

Electrical Exports for May.

The Bureau of Foreign and Domestic Commerce, Washington, D. C., has issued its monthly summary of the exports and imports of the United States for last May; from this report are taken the following data on the electrical exports during that month.

As compared with May of last year, the monthly total of electrical shipments shows a decrease of about 20 per cent, due largely to the almost complete cessation of exports to Mexico, which has hitherto been a liberal purchaser of American electrical manufacturers. As compared with the April, 1914, total, the May total showed an increase of over a quarter million dollars.

For the four classes for which the number of articles exported is reported, there were shipped in May as follows: electric fans, 2,647; arc lamps, 162; carbon-filament lamps, 36,847; metal-filament lamps, 47,723.

The detailed figures, together with those of May, 1913, are given in the following table:

Articles	May 1914	May 1913
Batteries	$ 57,311	.....
Dynamos and generators	277,265	$ 222,398
Fans	28,306	40,394
Insulated wire and cables	91,528	.....
Interior wiring supplies, etc. (including fixtures)	54,983	.....
Lamps—		
Arc	2,754	22,817
Carbon-filament	6,012	31,851
Metal-filament	12,032	32,962
Motors	413,214	357,645
Static transformers	49,464	.....
Telegraph instruments (including wireless apparatus)	5,069	8,615
Telephones	202,979	198,579
All other	839,803	1,643,626
Total	$2,040,720	$2,558,887

New Standardization Rules Adopted.

At a meeting of the Board of Directors of the American Institute of Electrical Engineers held at Detroit on June 25, the report of the Standard's Committee, submitted to the Board the standardization rules as recommended for adoption by that committee, was presented, but consideration was postponed to an adjourned meeting held in New York City, on July 10, and an invitation was extended to the members of the Standards Committee and representatives of other societies who had collaborated in the work of the committee to attend this meeting for the purpose of a thorough discussion of the matter. At this meeting, after a comprehensive discussion, the following resolution was adopted:

"RESOLVED, That the rules reported by the Standards Committee be, and hereby are, adopted, to take effect on December 1, 1914, subject to editorial revision by the committee for the purpose of correcting errors and clarifying the real intent of the rules."

Resolutions were then adopted by the board of directors expressing appreciation of the services rendered to the Institute by A. B. Kennelly, chairman; C. A. Adams, secretary, and the other members of the Standards Committee, and its various subcommittees, in performing the arduous duty of revising the rules.

The National Electric Light Association and the Association of Edison Illuminating Companies were also thanked for their co-operation with the Standards Committee in connection with this work.

American Telephone & Telegraph Shares Well Distributed.

The American Telephone & Telegraph Company, next to the United States Steel Corporation and the Pennsylvania Railroad, has the largest number of shareholders of any corporation in the United States. They total 53,737, while the United States Steel Corporation and the Pennsylvania Railroad have 124,094 and 84,244 respectively. Of all the corporations in the country only 24 have shareholders running into the five figures. Of these 11 are industrials and 13 are railroads.

On April 1 last the American Telephone & Telegraph Company had 223 shareholders holding more than 1,200 shares each—exclusive of brokerage houses—of whom 129, or 58 per cent, were residents of Massachusetts.

Following are some of the largest and best known shareholders of the American Telephone & Telegraph Company: The Atlantic & Pacific Telephone & Telegraph Company, 128,279 shares; Bankers Trust Company, 55,948 shares; George F. Baker, 16,760 shares; George S. Bowdoin, 3,600 shares; Theodore N. Vail, 4,000 shares; U. N. Bethel, 1,800 shares; Joseph J. Slocum, 20,400 shares; Zenas Crane, 18,323 shares; Winthrop M. Crane, 13,000 shares; Richard Olney, 9,107 shares; G. A. Armour, 1,226 shares.

Outing of Dayton Jovian League.

The July outing of the Dayton Jovian League was held on Wednesday of last week with great success, nearly 200 members and guests attending. The outing was held in Tecumseh Park, near Dayton, O., and the entire day was given over to sports and amusements, including baseball, volley ball, tennis, dancing, swimming and boating. The organization, which is comparatively young in Dayton, is maintaining its enthusiasm through the hot weather remarkably well, the monthly outings decided upon in lieu of the regular dinners having met with decided approval.

Electric Railway Manufacturers' Association Plans Exhibit.

H. G. McConnaughy, secretary of the American Electric Railway Manufacturers' Association, announces that a wireless message has been received from England, asking for space at the manufacturers' exhibit, in connection with the thirty-third annual convention of the American Electrical Railway Association at Atlantic City, N. J., October 12 to 16, inclusive. This is probably the first time in the history of conventions that a request for space has been made by wireless, and indicates an international reputation.

More space has been assigned to date for this year's exhibition than at any previous time. The million-dollar pier at Atlantic City has been re-painted and re-decorated, both inside and out. The committee is planning a number of additional improvements, particularly in Machinery Hall, which will be one of the most complete and finished rooms on the pier.

Receivership for Electric Company.

Several creditors of the States Electric Company, of Cincinnati, Ohio, have filed a petition in bankruptcy against that concern, the Western Electric Company being one of the petitioning creditors. John H. Wilson, of Barbourville, Ky., claims an indebtedness of $421.30 for royalties due on various electrical devices handled by the company, on which he holds patents. It is stated by the creditors that the company has admitted its inability to pay its debts, and its willingness to be adjudged a bankrupt on that ground. Joseph H. Woeste, of Cincinnati, has been appointed receiver of the company to conduct the business pending the bankruptcy proceedings.

Electric Floats for Wasatch Festival.

Active construction of the illuminated floats for the electric parade of the "Wizard of the Wasatch" is in progress at the Wizard's workshop in Salt Lake City, Utah, under the direction of Miss Emma L. Mulkey, the expert float architect and designer, who has been retained by the directors of the organization for this season's carnival, which will be celebrated August 25 to 29.

The electric parade will have 16 floats and 500 characters. Utah materials and Utah workmen are employed exclusively in the production of the floats. Those who have had the privilege of seeing the partially constructed floats are unanimous in the prediction that this year's electric pageant will be the most magnificent spectacle ever presented in the city.

Progress in Electrical Engineering Research at Massachusetts "Tech."

The research division of the electrical engineering department of the Massachusetts Institute of Technology, Boston, has issued a statement outlining the organization of the work in its charge and giving the subjects at present or lately under investigation. The work of the division has been facilitated by the recent co-operative agreement between the Institute and Harvard University, whereby the two departments of electrical engineering in these institutions were practically merged. The work of the division is directed by a research committee of which members of the department staff are a part, meetings being held monthly during the school year. Special efforts are being made to bring the members of the staff in close touch with the work of the division. By July 1 the staff of the research laboratory will include nine associates and assistants giving all their time to investigation.

During the past year the collection of data upon the study of the relative economic fields for electric, horse and gasoline trucks, begun in 1911, has been completed, and the final report will probably be completed early this summer. An extended study of the effect of the length of the passenger ride on street cars to the net return on the investment is under way, and it is expected that this investigation will require about five years. During the present summer an analysis of the delivery service of a large department store in New York City will be completed. The experimental work now being carried on includes a study of skin effect in solid and stranded conductors carrying high-frequency currents. In connection with this study there have been developed methods of measuring at 5,000 cycles a change in inductance of 10-8 henry or in resistance of 0.0002 ohm. The experimental work also includes a more accurate analysis of sound waves than has yet been made.

Other studies to be taken up shortly are an analysis of core losses at tooth frequencies in electrical machinery, an investigation of forced and free vibrations of unloaded and loaded telephone diaphragms, and a study of transient electrical phenomena in a 750-mile artificial transmission line. Apparatus has been developed for measuring the alternating-current resistance of railroad rails at frequencies up to 60 cycles, and measurements are to be made upon a number of tread and contact rails of different chemical compositions.

A fund of over $20,000 is now available for salaries, apparatus and other expenses in connection with the work of the research laboratory and library during the next year. The Theodore N. Vail electrical library of 30,000 volumes is now being cataloged, the collection containing practically every book on electricity and its applications published prior to 1910. Every effort is being made to bring the library up to date, and the collection will be one of the foremost in the world as soon as it is in working order.

Eliminating Electrolysis in Canton.

A system of return feeders, designed to take care of the current which is now causing the electrolysis of the water pipes in Canton, O., has been agreed upon by Prof. A. F. Ganz, who was employed as the city's electric expert to investigate the matter, and J. G. Swain, superintendent and engineer of the Northern Ohio Traction Company, whose circuits were causing the trouble. The company will enter into a written agreement with the city for the installation of the return feeders, which will be placed at various points where electrolysis has been noted and run back to the power house. Meters will be so placed as to allow periodic tests in order to see whether the system is working properly, and it is believed that by this means the city's water pipes can be fully protected.

Prof. Ganz has spent the past four months in Winnipeg, Manitoba, where he was retained by the Public Utilities Commission of the province to assist in an investigation of the electrolysis situation there. He will return there shortly to complete that work.

Central-Station Company Takes Out Life Insurance for Employees.

The Duquesne Light Company, of Pittsburgh, Pa., has just insured all of its employees on the group plan with the Equitable Life Insurance Company. Those employees, who have been in the service of the company for two years or more were insured at an amount equal to one year's salary, payable, in the event of death, in 12 equal monthly payments to any beneficiary designated by the insured. Those who have been in the employ of the company one year and less than two years were insured for an amount equal to one half of one years salary, payable in a similar manner. Inasmuch as the plan of insurance is intended more especially for the rank and file of the employees no policy was issued in excess of $2,400.

Oklahoma Coal.

Coal was mined in Oklahoma in 1913 to the amount of 4,165,770 short tons, valued at $8,542,748, both record-breaking totals for the state.

Progress Report of Patent Office Shows Gratifying Conditions.

Secretary of the Interior Lane has made public a report received from Commissioner Ewing of the Patent Office with respect to the output of work by the Patent Office since last August, when Commissioner assumed office. The report shows that since January 1, 1914, the number of applications passed for issuance of patent has been 6,987 greater than the number allowed in the same five-month period of last year. Since last August the number of new applications awaiting action has been reduced by 539 and the number of old cases by 5,152, a total reduction in the pending cases of 5,691.

"Within a reasonable time, said Commissioner Ewing, "I believe we will have disposed of all the delayed cases now in the Patent Office, and that the work will be in such shape that no cases need be delayed for more than two years.

"On January 1, 1912, there were 119,930 applications pending in the office. Applications are received at the annual rate of about 70,000, so it will be seen that the work has not been more than 18 to 20 months behind, as a rule. There was complaint, however, and very properly, of many cases greatly delayed. I found, for instance, that there were 4,007 cases between five and ten years old, and some cases even older, 69 of these having been in the office as long as fifteen years, and 780 being more than eight years old. While these old cases constituted only about four per cent of the total business of the office, their importance, and the work they entail because of their age, their complicated nature and the accumulation of papers, is far out of proportion to their number.

"We have been trying to clean up these old cases, and this effort is proving successful. Both the office corps and the patent attorneys are cooperating in a fine spirit, and with a few changes in methods we have been able to make the showing previously referred to, largely because of this cooperation. As an illustration of how these old cases are being disposed of, the number of those in the fifteen-year class have been reduced 25 per cent in the last year.

"It has been the practice of many attorneys, for years, to secure delays from time to time by filing amendments to their applications, many of which have been inconsequential and intended only to create delay. Under an order made several months ago, no amendments to cases more than eight years old are now accepted until I have passed upon them personally.

The result is that there have been fewer of this class of amendments accepted, and action on these cases has been accelerated. After December 1 next, under an order recently issued, the same rule will apply to all cases more than five years old.

"While the reduction in the number of applications pending has been gratifying, this reduction could be accomplished much faster and the work of the office could be brought up to date much more quickly, if we could have a little more assistance, for which we have asked Congress, as the present office force is working right up to its limit."

Receipts of the Patent Office for the first five months of this year were $968,376.49, as compared with $910,-531.23 for the same period last year. The receipts of the office last year were $157,000 in excess of the expenses. This year, Commissioner Ewing says, the office will turn over a surplus of more than $200,000. Since the establishment of the Patent Office, its receipts have amounted to more than $10,000,000, in excess of its expenses.

New Power Station in Ohio Coal Fields.

The central power-station enterprise now under way at Floodwood, O., in the Hocking Valley coal regions, is claiming increased attention in electrical engineering circles. Ground was broken for the power house early in May of the present year, a few weeks after the enterprise was announcd as a reality, and it is expected to be in operation not later than October 1. Construction is being pushed vigorously.

Plans for the power house call for a fireproof building. The foundation and basement walls are of cement, with floors of concrete and steel beams. A superstructure of steel framing will have walls of vitrified paving brick made from the native clays. Large windows of steel casing will give ample light. The engine room consists of three bays, on 20-foot centers and 52 feet wide. The boiler room also has three bays on 20-foot centers and 47 feet wide, with surplus space to install additional boilers.

There are being installed three 1,500-kilowatt Westinghouse-Parsons turbines, with a continuous overload capacity of 25 per cent, and a 50 per cent overload capacity for two hours. Surface condensers are to be used, and will be located immediately under the turbines. Two Alberger Corliss dry vacuum pumps, also the wet vacuum pump and centrifugal circulating pumps will be located in the basement under the turbines. The exciters are to consist of two one-kilowatt sets, turbine-driven and motor-driven, respectively, located on the main engine-room floor.

The installation of the boiler room calls for three 627-horsepower Flanner water-tube boilers with Foster superheaters. Green chain grates are to be used, and each boiler will be equipped with a Sturtevant induced-draft fan. Each complete unit is guaranteed to be capable of being operated at 100 per cent above normal rating. The boiler feed pumps will consist of one four-stage centrifugal pump direct-connected to turbine and one four-stage pump connected to motor.

The coal is to be taken direct from the mines owned by the company and dumped into a hopper, where it passes through a crusher and is then elevated to the bunkers which run the full length of the boiler room in front of the boilers. From here it will be spouted from the bunkers to the stoker hopper. The same conveying machinery will receive the ashes from hoppers below the stokers and convey them outside or to cars located over the coal hopper.

Current is to be generated at 11,000 volts, 60 cycles, three phase, and transmitted at 33,000 volts to mines and towns within a radius of 10 miles, and then transformed down to the operating voltage beyond the 10-mile limit.

The switchboard will be located at the east end of the building on the main floor, the switches and busbars to be on a gallery above the board and inclosed in individual compartments. They will be operated through a system of levers on the main floor. Electrolytic lightning arresters will give protection against lightning disturbance. All wiring in the station will be placed in conduits concealed in the floors and walls. The station is to be generously provided with indicating and recording instruments for the purpose of accurately determining the cost of production.

The building and equipment have been planned on the unit system, so that the building can be extended and additional equipment added from time to time as required, without disturbing the operation of the plant. Awaiting the opening of the plant is an immediate consumption, on contracts and business already secured, amounting to over 5,000 kilowatt-hours.

One of the most important municipal contracts—of which there are a number signed up, is that entered into within the past week with the town of Athens. It calls for a 25-year franchise for street lighting and furnishing power for the water works plant. While it is expected ultimately to reach Columbus and other cities, the plant has a great field in its immediate vicinity. Within a radius of a comparatively few miles are over 60 coal mines, producing normally about 8,000,000 tons of coal annually. A good list of these mines has already been secured as customers.

Connors' Creek Development of Detroit Edison Company.

The Connors' Creek Power house of the Detroit Edison Company is now under construction. One-third of the total capacity will be installed and the plant will be used to supply energy for power and light to the east side of the city of Detroit, Mich., and to the Detroit United Railways.

The first installation will comprise two 20,000-kilowatt General Electric horizontal turbogenerators running at 1,200 revolutions per minute and delivering three-phase 4,600-volt 60-cycle power. Steam will be obtained from two 2,365-horsepower Stirling boilers, which are being equipped with Taylor stokers. Electrically driven condensing equipment will be used. Electric power for driving all the power-plant machinery, excepting the boiler feed pumps, will be supplied from two special 1,000-kilowatt turbogenerators.

The 4,600-volt energy obtained from the two large alternators will be stepped up to 23,000 volts, no instruments being placed between the generators and the high-tension switchboard. The heated air from the ventilating ducts of the alternators will be passed direct to the stokers causing heated air to enter the fire boxes of the boilers.

The General Devices and Fittings Company, Chicago, Ill., will furnish all the insulators and inserts required in this installation.

New "White Way" in Pittsburgh.

Pittsburgh has created a new "White Way" which for brightness promises to rival the celebrated Broadway of New York. That portion of Fifth Avenue located between Penn Avenue and Sixth Avenue is the new white spot in the "Smoky City" that not even the reputed cloudy atmosphere is able to dim. It has an illumination of 260,000 candlepower, as compared with the 60,000 candlepower displaced. The work was installed by the Duquesne Light Company and, since this company is affiliated with the Pittsburgh Railway Compuany, the iron trolley poles have been used. The wooden poles which detracted from the appearance of the district have been eliminated. Mounted on ornate iron bases extending several feet beyond the poles, and 20 feet above the ground, are 52 upright luminous or magnetite arc lamps.

Application of Electric Power in the Fertilizer Factory.—II.

By F. M. Weller.

The first installment of this article described the sources of fertilizer and the methods of manufacture. Illustrations and descriptions were given of the application of electric motors to this industry, with the power requirements. Auxiliary equipment is here considered, with a discussion of the advantages of electric drive and central-station service. The progress made in electrifying fertilizer plants in Baltimore is shown.

The machinery heretofore mentioned may be considered as an indispensable part of the process as carried on in the average factory. Still other apparatus is found occasionally, its extent being regulated by the auxiliary operations which take place and by the degree of efficiency for which the management strives. For instance, a certain factory may have a considerable trade to supply with bone meal. A mill is therefore necessary to grind the cattle bones which are collected and imported generally from South America. These mills consist of a crusher, screen, bucket elevator, etc., and require from 30 to 40 horsepower. A very valuable refinement is also frequently found in motor-driven fire pumps, the pump being either centrifugal or triplex, generally the former. The usual capacities range from 500 to 1,500 gallons per minute, with motor capacities from 60 to 150 horsepower. A well designed installation consisting of a 1,000-gallon-per-minute pump working against a head pressure of 100 pounds, with 100-horsepower squirrel-cage motor is shown in Fig. 5. The location is the interior of a detached brick building, shown in Fig. 6, with the transformer house to the right, which houses also the switchboard, integrating meters and distributing circuits, thus freeing them from the corrosive effects of the acid fumes which permeate the factory. In recent years a very convenient labor-saving device in the form of a portable bag conveyor has come into general use. This is a series of moving platforms, which may be extended or shortened, to convey the bags from the gound to any level, and in its versatility the work of piling bagged goods is materially expedited, aside from accomplishing a saving in labor of four to six men. Several sizes are on the market, requiring respectively 3, 5 and 7.5-horsepower motors, and their consumption of energy is almost negligible in a large factory.

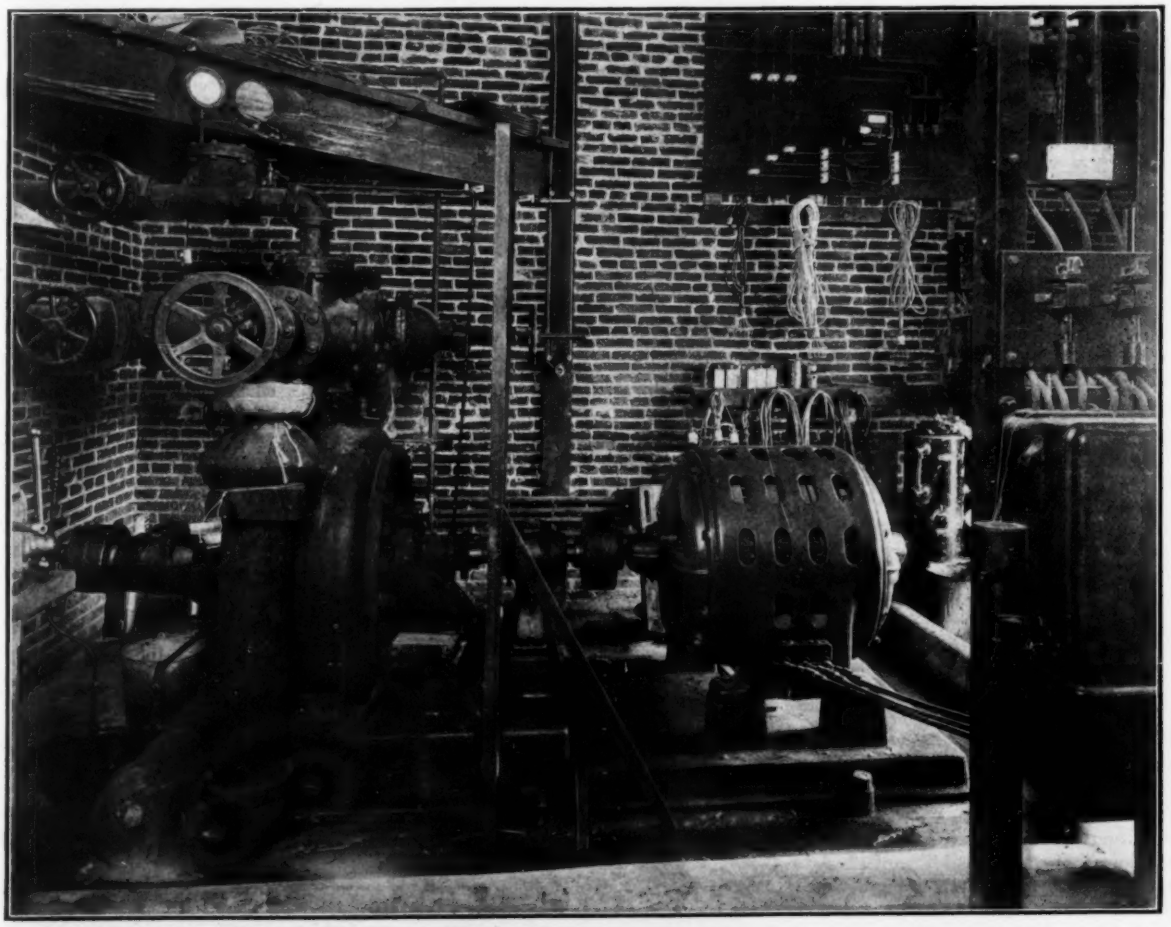


Fig. 5.—Centrifugal Fire Pump with Capacity of 1,000 Gallons per Minute Driven by 100-Horsepower, 440-Volt, 25-Cycle Motor, with Overload and No-Voltage-Release Auto-Starter.

A survey of the electrical equipment of these mills brings out several char-

acteristics worth noting, from the viewpoint of the best operating practice. First, regarding the choice of proper voltage, this may range from 220 to 550, a lower voltage causing excessive wiring costs and cumbersome construction in the case of large motors, while a higher voltage is considered dangerous, and calls for special equipment, besides being impracticable for the smaller motors. Voltages as high as 2,300 may be used in installations consisting almost wholly of group drive, as the wiring can be better protected. As for the wiring itself, conduit work is generally inadvisable, as it is more expensive and is almost sure to be corroded in time. The frequency of the service may be anything between 25 and 60 cycles, though preferably one of these two, representing a more standard equipment and easier deliveries by the manufacturers. Owing to the fact that slow-speed motors can be obtained in the 25-cycle class without the consequent sacrifice in power-factor, they are generally considered best, though their cost is greater than the 60-cycle motors. In the type of motor there is very little reason for doubt; except in the case of hoists, variable-speed machinery, and apparatus requiring high starting torque, the durability of the squirrel-cage motor and the absence of any current-collecting devices give it precedence in every case. All motor-starting boxes should be properly equipped with overload and no-voltage-release attachments, which possess the advantages of avoiding strains and disalignment of shafting, of protecting the machine and motor from overload, and insuring against possible damage following the sudden return of power after a momentary interruption. Incidentally it might be remarked that gear or other absolutely positive drive is very undesirable. Practically all of the machinery is liable to become choked and in these cases a drive capable of some slippage is preferred.

The standard lighting equipment unfortunately has not risen above the old 16 or 32-candlepower carbon lamps. A few tungsten and arc lamps may be found in use, but the service required and the renewal cost of the former, and the imaginary inaccessibility of the latter, with its necessary regular attendance, has not assisted in bringing either to universal adoption.

The general conditions with which electrical apparatus must contend in factories of this nature are universally severe. In very few manufacturing plants are they any worse. First of all, the acid fumes and acid dust attack both the windings and bearings. To militate against these evil influences, impregnated coils and dust-proof bearings are desirable, though the good results obtained from using the regular motors have generally been quite marvelous. Every factory should, as a majority do, have a supply of compressed air within reach of every motor, and the dust thoroughly blown out of these at least once a week.

Fig. 6.—Housing for Fire Pump and Switchboard to Left—Transformer House to Right Contains Four 100-Kilowatt Transformers.

A third and probably the worst enemy to starter and motor longevity is the unskilled labor which in the variety of its nationality and the invariableness of its presence is unexcelled by the constancy of the tides. There are always, of course, those in charge whose familiarity with things electrical is at least sufficient, but in the very nature of things the operation of the motors must be done by those working the machines which they drive, and the electrician's time is consumed chiefly in replacing contact fingers or other repair parts. In connection with a fourth inimical characteristic, the overloads due to the elevators becoming choked, instances have been noted when the motor, the starter and the supply leads were brought to the smok-

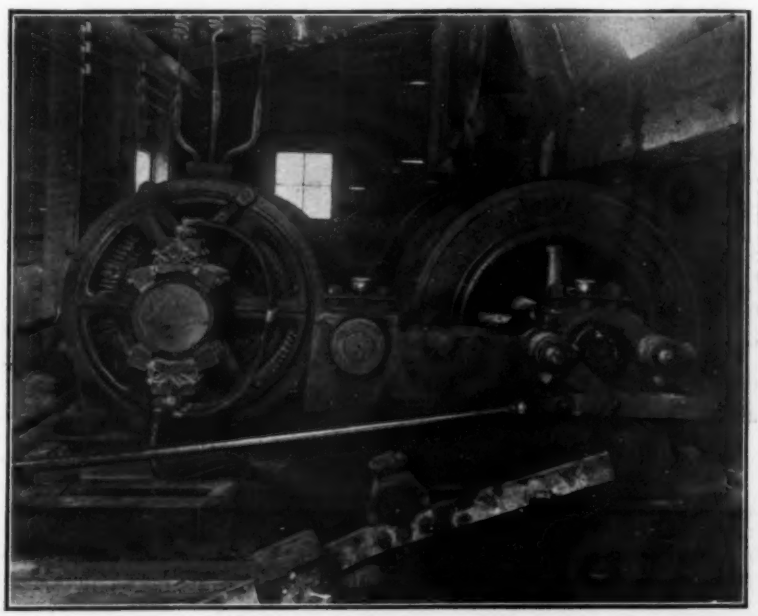


Fig. 7.—Fifty-Horsepower Wound-Rotor Motor Driving Single-Drum Hoist for Delivering Raw Materials from Vessels to Cars.

ing point in vain effort to start machinery, which with the elevator pit cleaned of excess goods, started beautifully.

An illustration of a still further outcome of labor conditions was recently had at a local factory in connection with an alternating- current (wound-rotor) motor-driven hoist, a view of which is shown in Fig. 7. Complaints of burnt-out resistance grids were continually entered against the firm supplying the hoist, who in turn "lambasted" the motor manufacturers, until a local agent of the latter investigated recording-wattmeter records taken by the central-station company, which by their evidence of improper operating conditions furnished sufficient data to attribute the cause of the trouble to the proper parties. At the time of installation of the recording instrument the excessive inputs registered by the hoist motor (50 horsepower) amounting to 192 horsepower, led to an investigation, which disclosed the fact that the operator was working the controller at such speed that practically all time element was eliminated. By decreasing the rate of movement of the controller handle the same amount of work was accomplished in an equal space of time at an input of only 60 horsepower, with, of course, no further complaint from grid destruction.

Advantages of Electric Drive.

This brings us to the advantages of electric drive, the above marking an especially valuable one. With recording meters installed on the power buses, instances of this kind can be easily detected and corrected, thus decreasing the cost of repair parts and minimizing unnecessary heavy demands made upon the source of power supply. Checks may also be kept upon the time of beginning and quitting operations in the mill, upon the length of time certain machines run, upon the continuity with which the material is fed to bagging machines, upon the regularity of ore supply to the furnaces, etc. The last named operation furnished an amusing incident recently, the object of the joke being the furnace tender, who was supposed to start a five-horsepower ore elevator to charge the furnace every half hour. The graphic record on a certain night showed defections from this course, and when called to account the following day the tender, realizing the effect upon the resulting product, stoutly maintained his innocence. The following night's record, however, showed absolute regularity, which has doubtless continued ever since, to the benefit of the acid produced.

In the most up-to-date factories the work is divided into three separate and distinct departments; the acid plant, the acidulating or wet mixing department, where the rock grinding and the acid and dust mixing take place, and the dry mixing department where the final mixing and bagging occurs. By the use of electric power each of these may be metered separately and the costs of their respective operations accurately obtained. The accompanying illustration, Fig. 9, shows this division over a two-year operation in an 80,000-ton-per-year plant, the extreme peak in April, 1912, being due to an unusual amount of acid phosphate supplied to the trade. An analysis of the above shows the following percentages of the total power, as used by the respective departments:

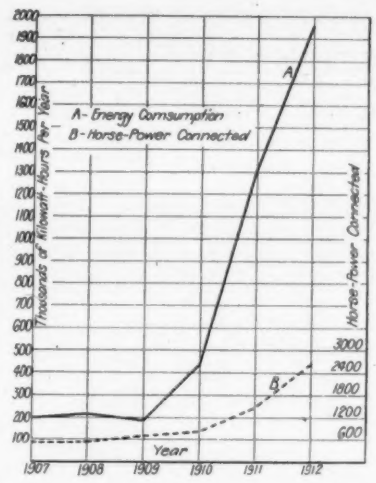


Fig. 8.—Power Requirements of Fertilizer Factories on Consolidated Mains.

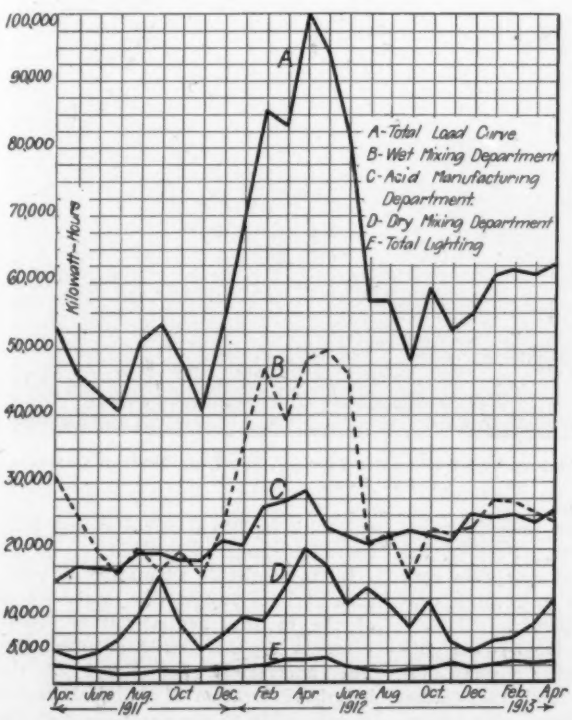


Fig. 9.—Energy Consumption of Departments in Typical Fertilizer Factory.

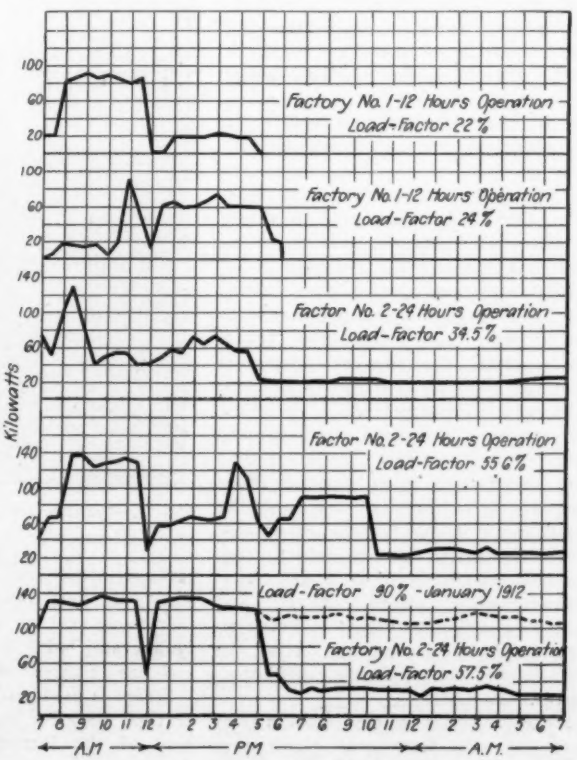


Fig. 10.—Daily Load Curves of Fertilizer Factories Having Different Load-Factors.

March, 1911, *to March*, 1912.

Total power and lighting consumption, 790,703 kilowatt-hours.

	Per cent.
Wet mixing department	46.2
Acid manufacturing department	35.5
Dry mixing department	14.7
Lighting	3.6

March, 1912, *to March*, 1913.

Total power and light consumption, 668,109 kilowatt-hours.

	Per cent.
Wet mixing department	44.5
Acid manufacturing department	35.5
Dry mixing department	16.2
Lighting	3.8

One of the local factories ran its initial five years of operation with no repairs at all and the usual ratio of those employing central-station power amounts to about $100 per year on a 600-horsepower installation.

The ruggedness and reliability of motor drive, especially with the alternating-current, squirrel-cage type of motor, has taken first choice over any other form wherever used. For this result, equal credit should be given the economy resulting from the ability to use individual drive and the convenience of being able to place each machine where it will work at greatest efficiency. As compared with shaft drive from a central steam engine this is a marked advantage, besides reducing the cost of belt, shafting and bearing maintenance.

Without electric power the present efficient car systems are impossible and this factory is thereby crippled to the extent of a rather uneven basis of competition with others.

Advantages of Central-Station Service.

Probing the power question still further, we find that central-station power, when offered at reasonable rates, represents the ideal supply for fertilizer factories for many reasons. Some of these may be stated as follows.

The investment for boilers, engines and possibly generators, together with pumps, switchboard and other accessories, often including an additional building, together with their cost of upkeep, is eliminated, and this money can be put into some profit-earning part of the business. The space thus saved may then be utilized for other purposes. An excellent idea of the small space which the use of outside power demands, may be gained from Fig. 11 which shows a small transformer house located between, and supplying power to, a large concern on either side, each factory having an installation of approximately 400 horsepower.

Since the usual factory location is at some distance from coal distributing centers, there is a notable advantage of being rid of the additional cost of transportation and the uncertainty of supply in bad weather. Further, the increasing cost of coal compares very unfavorably with the decreasing central-station rates for power.

Steam is used aside from power generation, only for heating a small portion of the factory and the offices. Accordingly, with non-condensing plants the exhausted steam is synonymous with inefficient running and such operation should be avoided.

In its admirable adaptation to overtime work for any portion or the whole of the factory, central-station power presents another striking advantage. The uncertainty beforehand of the length of duration of the work makes it impossible to fire the boilers of the plant to a proportionate amount. As

CHARACTERISTICS OF FIVE TYPICAL LOCAL FERTILIZER FACTORIES FOR 1912.

	A	B	C	D	E
Connected load, horsepower	282	356	350	319	601
Maximum demand (30 minutes), kilowatts	95	86	100	120	200
Maximum monthly consumption, kilowatt-hours	36,023 (April)	31,330 (April)	18,455 (December)	38,554 (March)	100,060 (April)
Average monthly consumption	23,655	15,000	11,785	24,291	70,587
Minimum monthly consumption	9,900 (July)	5,960 (June)	1,754 (September)	9,482 (December)	47,990 (August)
Load-factor, per cent. (24 hours, 26 days)	39.6	28	18.9	32.4	56.5
Number of motors	10	15	16	10	24
Approximate output in tons per year	60,000	50,000	60,000	60,000	35,000 bagged 45,000 acid phosphate
Number and type of grinding mills	1 Kent	1 Pratt 1 Sturtevant No. 2	2 Kents	2 Kents	3 Kents
Running hours per week	Grinding Department, 108; other departments, 60	60	60	60	Acid plant, 168; other departments, 60
Kilowatt-hours per month per connected horsepower	100.9	42.9	37.8	80	124.6
(based on an average yearly horsepower of)	234.3	350	350	319	566
Kilowatt-hours per month per kilowatt of demand	248.9	176.7	117.8	202	352.9
Average kilowatt-hours per unit output	4.7	3.6	2.3	4.8	8.8
Electric car system	Direct-current	Three-phase	None	None	None
Remarks	50-horsepower motor-generator set for cars			Direct current for entire factory furnished through 200-horsepower motor-generator set	Manufactures acid

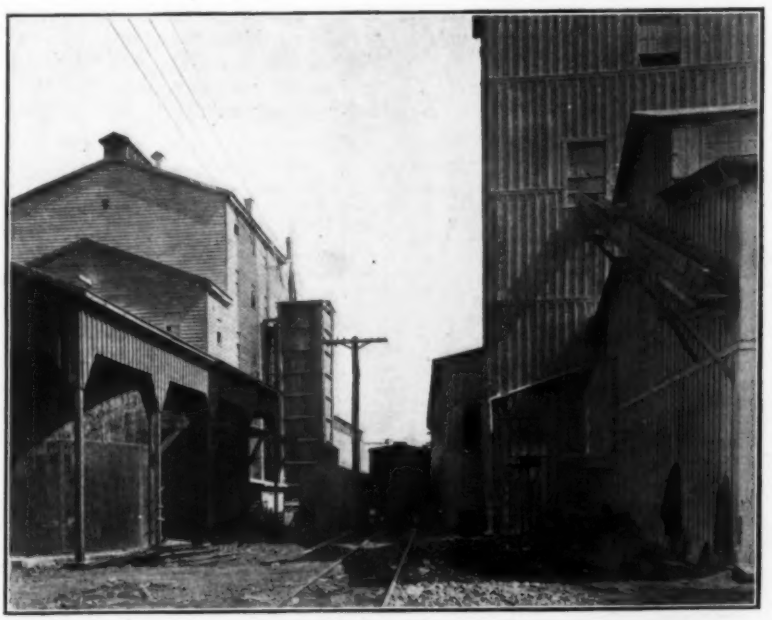


Fig. 11.—Transformer Housing for 300 Kilowatts Capacity, Supplying Separate Concerns on Two Sides.

a consequence fires must be drawn or an excess amount of steam generated and the plant attendants become very much disgruntled. The superintendent of a factory where a private steam plant was superseded by electric drive from outside power, stated after a year's operation under the new conditions, that for the above reason he would surely resign his position if a return to old conditions were ordered.

The elimination of the labor costs in connection with a plant, coupled with the uncertainty of retaining steady and reliable operators, is a further cause for the superintendents' comfort, and freedom to devote a larger amount of time to other phases of the production.

That the daily load in any fertilizer factory is by no means a constant quantity is shown by the curves, obtained from actual data, in Fig. 10. The difficulties and loss of economy in attempting to either adjust the size of generating unit to the load or in running a large unit steadily at low loads make the plant proposition an undesirable one. Further, the nature of the business requires two periods each year, one each in the early spring and fall, when the output reaches a peak and heavy constant demands are made on all machinery, while during the remainder of the season the average load is greatly reduced.

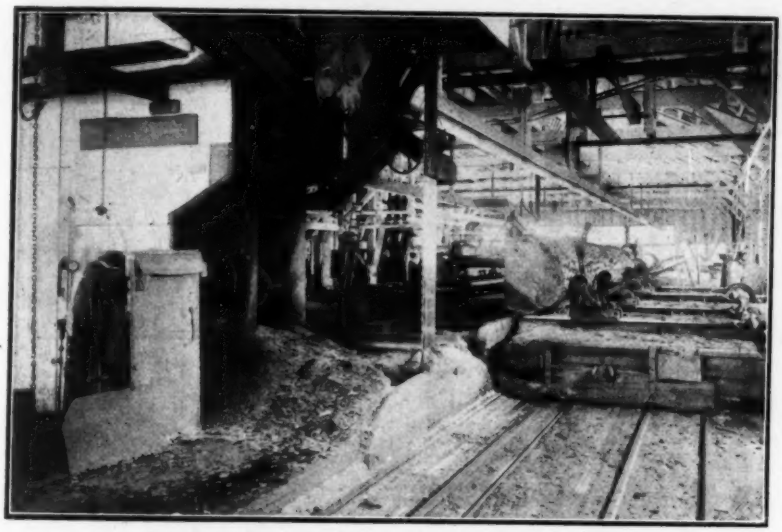
The central station is better able to cope with this condition also, since its flexible rates more equitably adjust themselves to the variable consumption of power throughout the high and low seasons of the year.

To afford some idea of the extent of this variation, and as a means of studying the operating conditions which obtain, the following résumé is given:

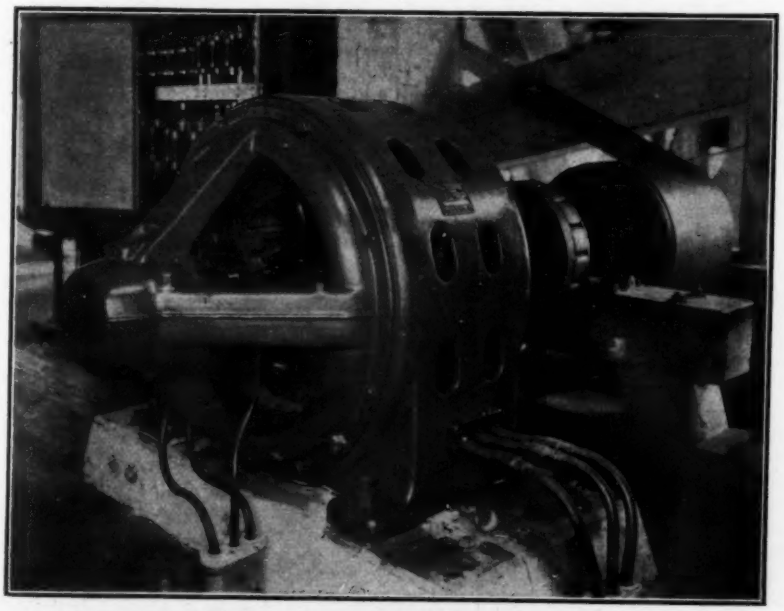
Without exception the new factories erected in Baltimore within the last five years have chosen electric drive and central-station service. The curves in Fig. 8 show at once the growth of the local fertilizer industry, as well as the very gratifying recognition by both new and established firms, of the superiority of electric drive therefor, the curves representing the actual increase in electric power supplied during the past five years, according to the figures here given.

SUMMARY.

	Connected Load Motors (Horse-Power)	Lighting (Kilowatts)	Yearly Kilowatt-Hours
1907	465	4.3	192,624
1908	465	4.3	210,233
1909	663	14.55	177,494
1910	833	21.0	434,529
1911	1,491	39.0	1,306,008
1912	2,642	62.8	1,943,264



Ten-Foot Band Headsaw in Stimson Mill.—Log Carriage at End of Travel.



300-Horsepower, 440-Volt Motor Driving 10-Foot Band Headsaw.—Speed, 600 Revolutions per Minute.

The Electrification of the Stimson Mill Company's Plant.

The plant of the Stimson Mill Company, located on Salmon Bay, Seattle, Wash., is the largest sawmill in Seattle and one of the largest in the Northwest, having an average daily capacity of 175,000 feet in 10 hours, and a record cut of 212,000 feet in the same length of time. The operation of the mill is confined to the cutting of Douglas fir, in the greater part, although some spruce and hemlock are also utilized.

The company owns 25,000 acres of Douglas fir timber land in Snohomish County, near the town of Bryant, where a large logging camp, employing about 174 men, is operated practically all of the year. The corporation owns and operates a standard-gage railroad from the logging camp to salt water, on Puget Sound, a distance of 22 miles, where the logs are then towed to the Salmon Bay plant, an additional distance of 35 miles.

The Stimson Mill Company was one of the first lumber manufacturing plants in Seattle to use electric motors to operate its woodworking machinery. Several other mills in and near Seattle have partially installed electric drive, some previous to this installation and others since it was demonstrated that the use of electricity in lumber mills is a success. This mill is claimed to be the most complete and best equipped plant of its kind in the world.

In the power house of the Stimson plant a 1,250-kilowatt, 480-volt, 1,800-revolutions-per-minute, three-phase, 60-cycle, General Electric turbogenerator furnishes power for the operation of the

machinery. The generating plant of the mill consists of the above-named equipment with motor-generator exciter; also one 75-kilowatt turbogenerator set for spare exciter, and mill lighting; one natural black slate swtichboard, consisting of generator and exciter panels and four feeder panels, and voltage regulator. With but few exceptions all the motors and electrical equipment were furnished by the General Electric Company.

In nearly every case the motors are directly connected to the machines and constitute a very effective example of the benefits of electric drive in the lumber industry. The group drive is also employed. The arrangement of the motors is such that great space economy is obtained; the usual assortment of belts and countershafts being practically eliminated, while the maximum power efficiency is obtained by the direct application of the motors, thereby avoiding a large percentage of the friction losses, which must commonly be carried by the power plants of steam-driven mills.

It is a conceded fact that the installation of motors permits the most economical use of floor space, as motors need not occupy valuable room. On account of their compactness they may be mounted on the machine or under it, or attached to the walls or ceiling. It has also been proven that the use of electric drive has decreased the number of accidents in mills. The elimination of belts passing through the floors and the ease with which machines can be stopped when a serious accident is imminent have contributed toward decreasing the chance of injury to employees.

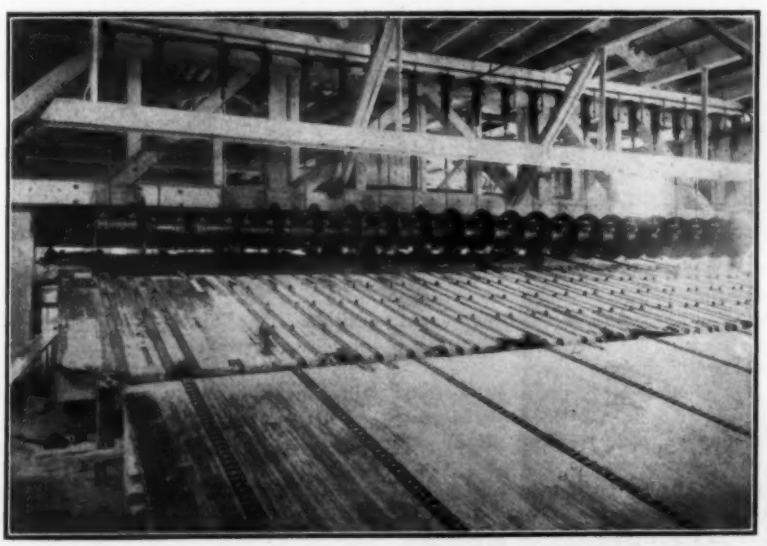
The power plant is equipped with a battery of three Wicks vertical water-tube boilers, with feed pumps, also with an induced-draft plant. The smoke from this plant is blown into a collector, which segregates the cinders from the smoke. The refuse drops into a receptacle and is washed away, and the smoke pursues its natural course. The plant is also equipped with an automatic feed-water regulator, and the most modern conveyors, which carry refuse such as sawdust, short pieces of unusable lumber, etc., from the mill to the boiler room.

Power for operating the planing machinery is furnished by a 300-horsepower slip-ring motor. The planing mill is of frame construction, 168 by 120 feet. The company also maintains a lath mill, which has a capacity of 25,000 laths per day. This portion of the establisment is driven by a 60-horsepower motor.

To facilitate the handling of lumber and to eliminate the use of horses, a motor tractor was recently added to the electrical equipment. The tractor is

200-Horsepower, 440-Volt Motor Direct-Connected to 12.5-by-84-Inch Edger.

No.	Horse-power.	Speed R. P. M.	APPLICATION.
1	15	1,200	Belted to Canting gears.
1	7.5	1,200	Belted to rock saw.
1	10	1,200	Direct-connected to rock-saw fan.
1	50	900	Direct-connected to 42-foot slasher arbor.
1	50	900	Direct-connected to 42-foot automatic trimmer arbor.
1	10	1,200	Belted to conveyor driver to boiler room.
1	300	600	Belted to 10-foot Allis-Chalmers band 16-inch head saw.
3	20	900	Direct-connected to jack-shaft.
1	40	900	Direct-connected to jack-shaft.
3	20	900	Belted to conveyor drive.
1	60	720	Belted to 24-by-30 Stetson planer.
1	15	1,200	Belted to conveyor drive.
1	15	1,200	Direct-connected to two 24-inch woodsaws.
1	5	1,200	Belted to conveyor drive.
1	60	900	Direct-connected to Stetson-Ross timber sizer.
1	40	1,200	Direct-connected to fan timber sizer.
1	15	1,200	Direct-connected to jack shaft.
1	10	1,200	Direct-connected to jack shaft.
1	3	1,200	Direct-connected to saw.
2	100	720	Direct-connected to jack shafts driving two 7-foot Mershon roll-feed resaws.
1	20	900	Direct-connected to Mershon band edger.
1	2	1,200	Belted to drive gear.
1	10	1,200	Belted to drive gear.
1	3	1,200	Belted to drive gear.
1	5	1,200	Belted to drive gear.
1	7.5	1,200	Belted to drive gear.
1	35	1,200	Belted to 30-inch movable bed hoist planer.
1	15	1,200	Belted to stripping machine.
1	10	1,200	Belted to California automatic cut-off saw.
1	300	600	Slip-ring, belted to line shaft in planing mill.
1	15	1,200	Belted to line shaft in machine shop.
1	40	1,200	Direct-connected to 8-inch centrifugal condensor pump.



Forty-Foot Trimmer Driven by 50-Horsepower, 440-Volt Induction Motor.

The Stimson mill claims the distinction of being the best lighted lumber-manufacturing establishment in the world. The yards are lighted by 30 flaming arc lamps, and the mill and planing mill, etc., are lighted by several hundred large incandescents and flaming arcs.

About 75 per cent of the cut of this plant is shipped to foreign ports, and the remaining 25 per cent constitutes the rail shipments.

The average monthly output of this plant is approximately 4,500,000 feet. This includes lumber that is converted into flooring, ceiling, bridge timbers, lath, molding, staves, rough and finished lumber, etc. The plant employs 175 men and operates 10 hours per day. The total number of motors installed is 37, with a combined capacity of 1488 horsepower. They operate at a power-factor of about 80 per cent. All of the wood refuse is used for furnishing steam for the dry kiln.

The accompanying table gives a list of the motors installed.

Commercial Practice
Management, Rates, New Business

POWER SERVICE.[1]

By J. H. Mitchell.[2]

Power service is exactly what the name implies—energy plus service. It is to the intimate union of these two features that this particular function of the central station owes much of its success.

The power producing and distributing plant of the central-station company may be regarded purely as a manufacturing industry designed and operated to supply a certain commodity to the public. Like any other industrial it has a production department relied upon to maintain efficient operation that its product may compete with other forms of energy in the market at a profit. It has an organization for handling the distribution of its product which is in a way analogous to the shipping department of any other large industry. Finally, it has a sales department engaged in developing the widest possible market for its product through the same type of personal effort that every industry over the country has found it necessary to use if it is to be successful. In these respects it is in no way different from any other large manufacturing concern and it is only natural that methods that have proven successful in older lines of business should be rapidly adopted by this newer one.

The power salesman is a comparatively recent development in the engineering field and in this respect also the central-station companis are merely following a line of sales endeavor already laid down by other manufacturing interests in the employment of technically trained men to care for the service feature of their business. His efforts are primarily devoted to "getting the business" and getting it in such a manner that it will be retained when once secured. He is largely responsible, entirely so to the customer, for prompt action and decisive measures in relation to the supply of energy which constitute service. Back of this, it is the broad co-operation of the actual operating organization which has charge of production, distribution and accounting that renders it possible for the sales department to stand in the minds of the customers of the company for all that service means.

Every power user is a prospective customer. This is axiomatic. Neither the kind of power he uses, the cost of it nor his mental attitude toward the central-station company can establish a negative to this proposition. In other words there are no impossibilities in the way of securing power business, although certain conditions, operating or otherwise, may render immediate action of a nature favorable to the central-station company improbable. The improbable power proposition of today, however, is the probable one of tomorrow, because all conditions are subject to change, and failure is written somewhere in the history of every isolated plant.

The successful power salesman will know personally every power application in his territory including those now using central-station power service as well as those which he expects to supply with it in the near future. In both cases he will have as favorable an acquaintance with the power user as possible and his every day methods will be of such a prompt and capable nature that when any question of any character relative to the use of the service he is selling arises, the customer, present or prospective, will instinctively turn to him for a solution of it. No problem should be too small to receive his careful attention, and none are too large, for behind him are the entire engineering resources of his company's organization ready to solve the most difficult problem that may be submitted. Prospective business will develop almost automatically if the present customer is served as efficiently as though he were a very live prospect and the power salesman is known personally to the prospective customer as an exponent of the ideals for which central-station service stands.

The economic reasons for the use of central-station power service are easily apparent to the present user, but the prospective user is not always so fully alive to all of them. As a general statement, these reasons are quite likely to take the following order of importance from his standpoint when the subject comes up for more or less serious consideration:

Lower cost of power,—considered purely from the standpoint of fuel and labor costs versus the cost of electrical energy.

Easy increase in power equipment to meet manufacturing requirements without heavy initial investment.

More efficient operation due to the use of electric drive in place of mechanical transmission.

Elimination of difficulty in securing competent labor for power plant operation.

Elimination of personal effort on the part of the management in the way of plant supervision.

Better working conditions for employees due to convenience and cleanliness of electric power service together with the decreased hazard secured by the change from mechanical to electrical transmission.

These reasons, beginning with the first, are likely to receive consideration almost directly in proportion to

1 A paper presented before the convention of the Ohio Electric Light Association at Cedar Point July 21 to 24.

2 Electrical Engineer, Columbus Railway, Light & Power Company.

the amount of power used, largely for the reason that with the smaller concerns the outlay does not warrant a careful study of all the conditions by the power user. The cost of power, however, increases in an inverse ratio to the amount of power required, so that in dealing with the smaller concerns the ability of central-station power service to compete with mere fuel and labor costs is one of the easiest things that the power salesman has to demonstrate.

A tentative interest aroused, it becomes necessary to present to the prospective customer a definite proposition in an intelligent form. To handle this situation properly it is necessary to investigate the manufacturing plant in question very thoroughly, making determinations of all energy requirements together with existing costs of operation and general operating data. This information should be put in clear concise form so that the plant owner can readily bring his own judgment to bear upon it.

Business naturally follows an economic line and its unit of measurement is the dollar, a standpoint from which the power salesman should prepare his report, all results being reduced to a dollar and cents basis, with a definite reason for every figure. His own personality should primarily be depended upon only to secure a favorable reception for and careful consideration of his report.

An engineering report such as mentioned above covering a given industrial plant would probably follow the following outline, subject, of course, to modifications necessary for any individual example.

Object.

Under this head a definite outline of the problem to be solved together with a generalization of its solution as set forth in the body of the report should be given.

Findings.

Description of plant.—A concise detail of equipment from point of fuel supply to point of utilization of the energy developed together with any other information of this nature that may appear to be desirable.

Test and Observations.—A description of the arrangements made to secure data necessary for the solution of the problem in hand.

Results.—Giving the final conclusion derived from the data secured by means of tests and observations as outlined, specifically including:

Present amount of energy developed.

Losses to be eliminated by use of central-station power service.

Period in which the energy is required.

All data being reduced to an annual basis.

Present Costs.—A detailed statement of investment, fixed charges, fuel, labor, maintenance, supplies, etc.

Future Costs.—A detailed statement of investment, fixed charges, cost of energy and other items involved in the substitution of central-station power service for the existing method of supplying power.

Comparative Costs.—Summarizing the cost under both conditions previously given and presenting the difference shown in favor of or against the use of central-station power service.

Recommendations.

Object in View.—Presenting an outline of the results which it is considered desirable to secure in making any changes. This outline furnishes the basis for the recommendations.

Changes Required.—Recommendations as to equipment to be discarded, equipment to be installed or both will be included together with an outline of any plans and specifications that may be submitted.

Costs of Changes.—Under this head will be included careful estimates on the expense involved in following out the recommendations.

Advantages.—A resume of the results to be effected by carrying out the recommendations.

Summary.

A brief recapitulation directing attention to the salient points of the report.

Appendix.

Not necessarily for presentation to the prospective customer. In this will be included all detailed data secured in tests, all graphics, all the details of plans and specifications and all detailed estimates on investment. Containing the actual data obtained in the investigation, it should be carefully filed as a part of the office copy of the report.

An engineering report is essentially the solution of a definite problem, and all tests and observations are made with a view to securing definite values to be used in reducing a number of physical conditions to dollars and cents. Consequently in arranging an outline of these tests and observations to be made, this central problem must be held strictly in view, every effort being made to secure data directly pertinent to it, eliminating as far as possible features of less material interest. Thus the work as carried out may be simple or complicated according to the kind and variety of information it may be necessary to obtain. In any event the tests are likely to be much less complicated than the usual laboratory type of test.

Estimates of cost of operation should be made from careful observation of the actual conditions applying at the plant in question and for industries of small or moderate size, the power user should be depended upon as little as possible for information relative to these costs. Offhand information that he may possess is likely to be full of errors and it is usually better policy to submit a complete estimate of annual operating expense which he can check against his own books. This checking process has the additional advantage of completely familiarizing him with all the details of the proposition, and if the estimates have been carefully prepared the closeness of the estimate to the actual costs will increase his confidence in the entire report.

Fixed charges as a factor in cost of producing power, while well understood by large power users, is one of the last items that the small power user may be induced to consider. In dealing with the latter it frequently simplifies matters to take the annual saving made by use of central-station power service and figure it as a per cent earned on the new investment required neglecting the displaced equipment entirely or crediting its salvage value against the cost of the new installation. Large propositions should carry fixed charges in the usual form of interest, depreciation, taxes and insurance. In this connection it is well to bear in mind that on existing plants that are to be displaced, a saving in fixed charges can be made only on the salvage value of the equipment plus the value of space occupied by the plant, the balance of the investment being irrecoverable. The full amount of fixed charges will of course apply in making cost comparisons for projected plants for which the investment has not yet been made.

Estimates giving cost of equipment should include general specifications and such detail as may be necessary together with any drawings it may be deemed advisable to make.

Estimates on cost of central-station power service should be based upon test as far as possible, tests being made on existing equipment under operating conditions, and they should be of such a conservative nature that any error existing in them will be in favor of the prospective customer. This general conservatism should apply through every portion of the report. The primary object of the report is to secure business. An equal object must be to secure it on such a basis that it may be retained when once connected. To this end the engineering side of the proposition must be as clear and unbiased as though

the power salesman were acting as consulting engineer to the customer. The ethical side of industrial power sales work is as clearly defined and must be adhered to as rigidly as though the engineering question was the only thing to be considered if the prosperity of power service in general is to increase. In the event of the tests and observations as conducted failing to show that the situation can be improved under given conditions by the use of central-station power service, a candid statement to that effect made after all the facts are known is usually the most far-sighted policy that can be employed.

Having already furnished tentative plans and specifications for an electrical installation in his report, it will frequently be necessary for the power salesman to look after the matter of securing bids from contractors upon these specifications and act generally in an advisory capacity toward the customer with relation to them. By so doing he can safeguard the customer's interests and secure an installation that will give satisfactory results. Not only will the power salesman see that the work of installation goes on smoothly, but he will see that sufficient correct information is supplied to constructing and operating departments of his own company to enable them to provide service at the exact time and place wanted.

Proper inspection and tests should be made at once when new installations are put into service to the end that the customer, contractor and power salesman shall have mutual assurance of satisfactory operation of equipment. In the event of failure of any apparatus or in the event of any modifications becoming necessary, such changes and adjustment should be made at once, the power salesman following the situation up closely and seeing that definite action of a satisfactory nature is secured.

Energy consumption by new installations should be watched for the first few months with special care in order to see that estimates on cost of operation are checking up properly. Beyond this, the use of power service by each individual industry should be followed up by the power salesman in whose territory it lies. To this end it will be found advantageous to use some form of card for each individual power user giving essential data relative to consumption of energy and cost. By this means the power salesman, who is the logical person to handle any controversy that may arise between the company and the power user, may have an opportunity to look into any unusual condition and straighten it out before it develops into a real difficulty.

The power salesman builds for the future. Much of his effort is necessarily a type of missionary work, but careful power sales work is cumulative in its results. Results are seldom secured at once although once started they increase rapidly. The larger the proposition in hand the more inertia it is likely to have, requiring a larger effort applied through a longer period to set it in motion. To borrow a portion of the phraseology of a concern that advertises nationally, it is the "Service You Will Eventually Buy" and with every new installation a new advertisement for central-station power service, the word "eventually" is coming to have a definite time value for more industries every day.

Schooling Central-Station Commercial Men.

As a means of instructing, stimulating and keying up the members of the force employed in the commercial department of the Louisville Gas & Electric Company, a series of Saturday afternoon meetings have been arranged, at which the men will hear from experts in their several branches of the electrical profession of what is doing in the way of developments. Robert Montgomery, manager of the department, has organized the meetings in the belief that they will serve to liven up the whole force, to give the members talking points and make them live to see opportunities to get business they would be liable to pass now.

One of the recent sessions of the "class" was addressed by Henry B. Hewitt, manager of the electric vehicle department of the Kentucky Wagon Manufacturing Company. Mr. Hewitt discussed the electric vehicle in all its phases at length, especially with its relation to the central-station business. Another speaker was Joseph B. Fitzgerald, illuminating engineer stationed at the Cincinnati office of the Westinghouse Electric & Manufacturing Company. His subject was the nitrogen-filled tungsten lamp, which he discussed in detail, explaining the principles involved in its construction, requirements which its use involves and the special uses for which it is adapted. One of the next subjects to be considered is tennis-court lighting.

Possible Electric Cooking Load.

J. H. Bowden, borough electrical engineer at Poplar, London, England, in his annual report says that some idea of the immense possibilities of the cooking load may be derived from the fact that 3,000 kilowatt-hours used annually by a family not exceeding five persons is a fairly moderate estimate; this would yield 600 kilowatt-hours annually per head of population.

Central-Station Progress in Louisville.

The Louisville (Ky.) Gas & Electric Company gained 1,864 electric lighting customers during the seven months ending June 30. This represents a net gain of 10.5 per cent in this class of patrons. Most of the new business has resulted from a special house-wiring campaign which is still in effect, and which has relied upon local newspaper advertising plus progressive salesmanship for success.

A total of 625 horsepower in new electric power business was secured by the commercial department of the company during the week ending July 3. Among the power contracts was one for 175 horsepower with a tannery company, which is an addition to the present electric installation and displaces a steam power plant. Another contract is with the Kentucky Veneer Mills for 139 horsepower. In addition to the power business the department closed 237 lighting contracts for 98 kilowatts, and took contracts for wiring 17 houses.

Electric-Fan Campaign in Sandusky.

The Sandusky Gas & Electric Company, of Sandusky, O., using the slogan "Do It Electrically," of the Society for Electrical Development, of which it is a member, is featuring in the liberal newspaper space, which it is regularly devoting to the exploitation of electricity, the fact that the use of electric fans in business houses is a very efficacious first-aid to good business in hot weather. It points out that dealers in food and drinks, such as restauranteurs and saloonkeepers, found this out long ago. Following out this argument, it is stated that the same idea is equally valuable to dry-good merchants, shoe dealers and grocers, for the reason that people will do business at the place where they are made the most comfortable. The low cost of operating electric fans is emphasized, and the company's advertising along this line, it is stated, together with the torrid weather of the hottest summer Ohio has had for some years, has helped business wonderfully.

Successful House-Wiring Campaign in Small Town.

C. A. Smith, who financed the construction of an electric light plant at Wellsville, Kans., is conducting a house-wiring campaign. Mr. Smith, who is a retired capitalist, produced the money for the plant after the municipality had decided it could not afford the expenditure at that time. Local residents are arranging for the use of electricity almost without exception as the result of Mr. Smith's generosity.

Electric Sign Data

Trinity's Electric Sign.

With the development of the institutional features of Trinity Parish House, John M. McGann, rector of Trinity Episcopal Church, Chicago, found himself in a peculiar situation. The Parish House, a beautiful Gothic stone structure, stands adjoining Trinity Church on Twenty-sixth Street at Michigan Boulevard, in what was a decade ago the most exclusive residence district in Chicago. As the commercial sections of the city expanded steadily to the south, small stores and later larger commercial structures began to multiply along the main arteries of travel and encroach upon the strictly residential aspect of the whole neighborhood. This tide of commercial expansion, bringing its new life with it, submerged the old residences along some of the avenues, leaving Trinity Church the northern outpost of what was formerly a residential district exclusively.

With this new life at his very door, the rector of Trinity was not slow to seize upon the great opportunity of making Trinity Parish House a center of moral influence in the changed surroundings. With the methods well in mind that have made Hull House and other social enterprises in Chicago famous for their effectiveness and influence the Parish House was turned over to the young people of the community, gymnasiums and reading rooms, billiards and other amusements provided. Neighborhood dances, with instruction for those that desired, were instituted. And to let all know about it, the idea of electrical aid was adopted.

At its best, Twenty-sixth Street is poorly illuminated by the few lamp posts that did duty when it was a quiet residence side street. The location of the Parish House almost required a chart and compass after dark; certainly it did not attract or invite anyone to its doorway. Light was needed and the idea of employing an electric sign to mark the entrance was evolved. Photographs of the building were submitted to Architects Lowe and Bollenbacher, who prepared a design, the simple Gothic dignity of which blended in architectural detail with the building and yet did not lose its force and legibility, so necessary in an electric sign.

The sign is illustrated herewith. Massive bronze chains and square bronze rods support the sign, necessitating the piercing of the stone wall two feet thick for a secure anchorage.

The sign can be read for two blocks in either direction and the outline of the cross for five blocks, as far as one can go before the direct view is shut off. Although only 9.5 feet long and 4 feet high over all the Trinity sign is most beautiful and distinctive.

The largest two-face electric sign in Marion, O., will be that of the Marion Photo-Play Company, which has just let the contract for its construction. The sign will be 16 feet in width and 20 feet in height, and will have over 600 lamps, many of them vari-colored. The design is that of a flower pot, from which six electric rays will ascend, one at a time to burst and spell in great white letters the word "Marion," the rays dropping again as in a pyrotechnic display and breaking near the flower pot into stars. It will be the largest and most attractive electric sign in Marion.

Five great electric signs that are read by millions of persons every week have been given to the use of exploiting the Panama-Pacific International Exposition. The first two were the Chicago & Northwestern Railway sign on the Rush Street bridge in Chicago and the Marcus Loew sign on the Hudson River. The three later ones are: The Cohan & Harris sign in front of that company's Astor Theater, Times Square; the William Morris sign on the New York Roof Garden, and the Coca Cola Company 20-by-20-foot sign on the Chandler Building on West Forty-second Street.

The Capital Electric Company, of Salt Lake City, Utah, has been awarded the contract by the Oregon Short Line Railroad to install a gigantic electric sign on the roof of the Union Depot of the Oregon Short Line and Salt Lake Route in Salt Lake City. On the south end of the depot the words "Salt Lake Route" will be spelled out in full in 36-inch letters, and on the north end of the depot the words "Oregon Short Line" will be spelled out in letters of the same size. Between the two signs the Union Pacific shield will be outlined in lamps with colored caps with the words "Union Pacific System" written diagonally across the face of the shield. This shield is 18 feet wide and 24 feet high. The lower half will carry the illuminated dial of a clock.

The sign will contain 1,007 25-watt lamps.

Sign erected for Trinity Parish House, Chicago, by Federal Sign System (Electric).

Body is of cast bronze from special molds. The faces of raised Gothic letters and of cross are of white porcelain-enameled steel. The words "Parish" and "House" are in milk-white leaded art glass upon an amber background. They are illuminated from within.

Sixty-nine frosted carbon lamps are on the face of the sign.

Electrical Construction

THE WIRING OF A DEPARTMENT STORE.

A Description of the Installation of Edward Schuster Company, Milwaukee.

The department store of Edward Schuster Company, located at Third and Garfield Streets, Milwaukee, Wis., is at present being rewired and an extensive addition, together with a power house and carpenter shop, is being constructed. Power for the old building was previously obtained from

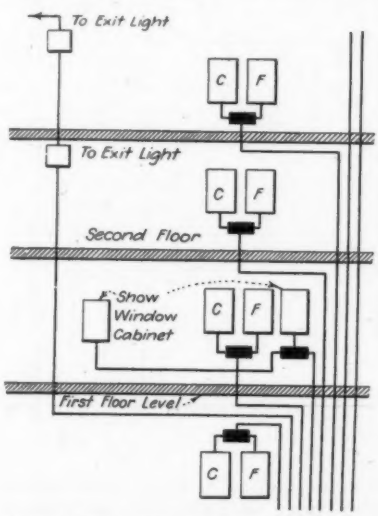


Fig. 1.—Riser Diagram for North Shaft.

an isolated plant in the basement, but this plant will be dismantled and central-station power will be used in both the old and new portions of the store. Owing to the fact that extensive additions to the original lighting circuits of the old store by means of exposed steel-armored cable had increased the fire hazard and had caused the distribution of lights to become somewhat nonuniform, it was decided to remove all the steel-armored cable and to replace it by wires carried in metal molding, arranging the lighting units to conform as far as possible with those in the addition now under construction. Moreover, as business is not being suspended during these alterations, it is necessary to make these changes in wiring without shutting down the present isolated plant and without causing much dirt or obstruction. Some idea of the extent of the alterations to be made may be obtained from the fact that fully 9,000 feet of molding will be required in the old building.

The complete contract, covering, in addition to the rewiring of the old building, all the feeders, power and light circuits and cabinets, show-window circuits, telephone system, signal systems, sprinkler alarm system, clock system, and gas-ignition systems, was awarded to Henry Newgard & Company, of Chicago and Milwaukee. Vaughn, Meyer and Sweet, of Milwaukee, are the consulting engineers.

Wiring in Old Building.

The old building contains four main floors, a basement and a fifth or storage floor. In the basement was located the isolated generating plant which supplied 220 volts direct current for power purposes, and 110 volts over a three-wire system for lighting. As the same voltages will be used under the new arrangement, no change will have to be made in the old distribution cabinets or in any of the concealed conduit work. Under the new arrangement separate feeders will be carried in conduit from the distribution board in the basement of the annex comprising the power house and carpenter shop to the cabinets for the various floors, show windows, kitchen and basement. From the cabinets, which are the original ones, the old feeder circuits will be used to the ceiling outlets. Sherardized National Metal Moldings and fittings are used to carry the wires from these outlets to the lamps, which are to be arranged with four lamps per bay. Single-braid rubber-covered wire is used for these circuits.

In order to expedite the work, small tool benches mounted on rollers are moved to the seat of the work. Upon these benches are mounted the cutting and punching tools together with a number of fittings, thus permitting all the mechanical work on the conduit to be done at the job. In making the holes in the ceilings to support the molding, all hand hammering was avoided by employing manually operated mechanical hammers mounted on adjustable poles, which permit the holes to be formed with very little noise and dust in a few minutes. In place of plugging these holes with wooden pegs for holding the screws fastening the molding, Van expanders are inserted, thus avoiding the loosening of the molding due to the shrinking of wood pegs. After the wires have been placed in the molding, the capping is placed on and held by galvanized iron straps.

In making these alterations the circuit for the outlet upon which work is being done is opened, the old fixtures and wiring removed and the new installed, thus permitting the work to

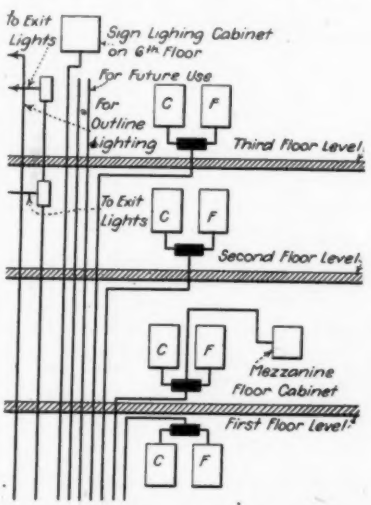


Fig. 2.—Riser Diagram for South Shaft.

progress without shutting off the current from any other lamps.

Power Plant and Addition.

The new construction includes a three-story addition with a six-story tower to the west side of the old building and a separate one-story building in which will be located a carpenter shop on the main floor and a power plant in the basement. Power will be obtained from the underground conduits of the Milwaukee Electric Light and Power Company over 2,300-volt, three-phase, 60-cycle mains, and carried from the service switchboard through five four-inch conduits, each carrying three 1,000,000-circular-mil cables to a bank of single-phase transformers which will reduce the voltage to 220 volts, three-phase, for power service, and to 110-220 volts for the

three-wire lighting system. From the transformers the power will be delivered to the distribution board located in the basement of the annex together with the transformers through three four-inch conduits, each containing three 1,000,000-circular-mil cables, two additional four-inch conduits being installed as a reserve.

Switchboard Details.

Fig. 3 shows a drawing of the main switchboard now in the course of construction, while Fig. 4 shows the connection diagram for the board. From the diagram it will be seen that three single-phase transformers will be employed for reducing the 2,300 volt three-phase service to 110-220-volt single-phase three-wire lighting service. One transformer will supply the south half of the new store, another will supply the north half of the new store, while the third will supply the old store. The three wires supplying the 110-220-volt lighting current to the switchboard panel will be run in four-inch conduit, each conduit containing three 500,000-circular-mil cables which means that the neutral wire of each circuit will be of the same size as the outside wires.

A current transformer will be inserted in each outside wire of the lighting circuits as they leave the transformer. These current transformers will supply the power company's watt-hour meters located on the panel at the right end of the board. The main remote-control oil switches are also mounted on this panel.

From the switchboard diagram it will be noticed that the north and south halves of each floor will be supplied by separate three-pole fused switches. The floors of the old building will each be supplied by a separate switch. Current transformers will be inserted in the outside mains for each lighting current as shown, the transformers being connected in parallel and supplying the necessary current for the current coils of the watt-hour meters to be provided for each circuit. One side of the secondary of each current transformer will be grounded. An ammeter will be provided for each of the three feeders supplying energy to the lighting panels. Ammeter jacks will be used so that the meters can be used to measure the current in either leg of the three wire lighting feeders.

A separate two-wire 110-volt circuit will be installed to supply the exit lights, a double-pole double-throw switch permitting the circuit for the exit lights to be supplied from either the buses for the north or south lighting circuits for the new store. N. E. C. standard inclosed fuses mounted on the front of the board will be used for all lighting circuits. A large electric sign is to be supplied by a separate set of feeders. The marquee and show windows are to be supplied by individual and joint circuits as indicated on the diagram. Trumbull fused knife switches will be used for all lighting circuits.

For power service three single-phase transformers with primaries and secondaries connected in delta will be used to transform from 2,300 volts, three-phase to 240 volts, three-phase. Condit-type oil circuit-breakers with the handles mounted in a downward direction will be used for each power circuit and a reverse-phase relay will be employed. Current transformers furnishing current to ammeters and watt-hour meters will be employed.

The switchboard is being constructed by Henry Newgard & Company.

Distribution Circuits.

From the distribution board lighting cables are run to the wire shafts in the old and new buildings, and a power cable to the north wire shaft of the new building. Power and light risers supply current to the carpenter shop situated on the main floor of the annex. In passing underground from the annex to the store, the conduits are run in terra-cotta ducts. The entire distribution of power for the various floors, elevators, exit lights, etc., is effected at the main distribution board, thus eliminating the necessity for additional distribution boards in the store buildings. Three wire shafts will be employed, one in the old store and one each for the north and south sides of the new building.

Separate show-window feeders and cabinets will be used, one cabinet being located at the west end of the building and the other at the east end. About 200 National X-Ray scoop reflectors will be used for show-window lighting.

The riser diagrams for the north and south sides of the new building are shown in Figs. 1 and 2, respectively. On each floor separate cabinets are used to control the ceiling and floor outlets as shown by the letters *C* and *F*. A separate feeder is run in each wire shaft to supply the emergency lights. From the cabinets on

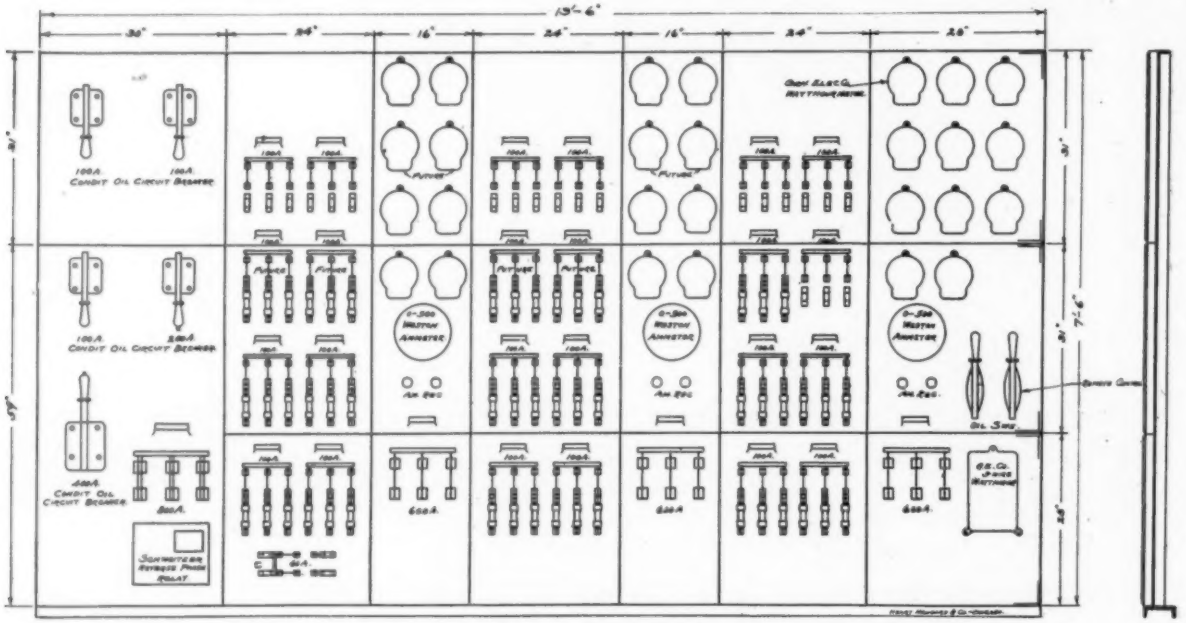


Fig. 3.—Sketch of Front of Main Switchboard.

each floor feeders are carried in conduit to the various outlets, fan outlets being placed in each bay and connected to one feeder. The conduits are laid in the concrete floors above the I-beam, thus permitting the feeders to be run in straight lines to the corresponding bays.

In order to insure perfect joints between conduits and outlet boxes adaptibox detachable-back outlet boxes are being employed. By their use considerable time is saved in installation and the danger of locknuts becoming closed while turning the outlet boxes during installation is eliminated.

Another innovation which was devised to save time and labor when the distribution cabinets are not available at the time when the brick walls reach the corresponding height, is the substitution of wood frames of the same size as the cabinets to be used. Each frame is bored for the conduits which are to enter the cabinet, thus making the installation of the corresponding cabinet at a later date an easy matter.

In order to prevent the failure of all lamps supplied from one cabinet upon the blowing of a main fuse, it was decided to equip each cabinet with a Cutter-type unfused main switch and to place fuses in each branch feeder circuit.

The wiring for the numerous concrete columns employed in the building is of special interest. Fig. 5 shows the details of a typical column and its wiring. The conduit, outlet boxes, etc., are fastened to the sides of the wood forms. However, the main difficulty in wiring a concrete column is generally experienced at the points where the electric service enters the column. In many cases this connection is made by chiseling a space for the necessary conduit out of the concrete columns after construction. The necessity for this tedious work was eliminated by nailing wood blocks in the wood frames beneath the baseboard outlets, thus leaving spaces in which the necessary conduit can easily be inserted and joined to the outlet boxes.

Another interesting feature of these columns is the use of the Dayton inserts as a means for supporting electric fans. These inserts are fastened in their proper place in the wood forms and hence become securely imbedded in the concrete columns. When a fan is installed, the head of a bolt is inserted in the Dayton insert and the fan base screwed to the bolt, a wood mat being placed between the column and the base of the fan. The electrical connection with the fan is made by means of wires leading to the fan outlet shown in Fig. 5. By using these inserts all trouble due to the loosening of fan supports is avoided.

Considerable annoyance was experienced at first, by the workmen disturbing the electric construction in the column forms when inserting the reinforcing rods and spirals. In order to protect the electrical work, it was decided to provide the men placing the reinforcing in the forms with long pieces of sheet-iron to be placed next to the electrical work, while inserting the necessary reinforcing iron into the wood forms.

Gas Ignition System.

Another unusual feature in this store is the use of gas emergency lights in addition to the electric ones. These gas lights will be provided on all stairways and at frequent intervals on the main floors. An electric ignition system will be provided for these lights, current being obtained from a 120/12-volt bell-ringing transformer without the addition of a spark coil. Push-button switches will be employed to control these lights, the stair circuits being so wired as to permit the control from each landing of the gas lights illuminating the flights of stairs leading to the floor below and the floor above. The ignition circuits comprise two feeders of No. 12 wire and auxiliary circuits of No. 16 wire, all carried in conduit.

Manager's Call System.

Fig. 6 shows the circuits for an elaborate manager's call system that will be installed. Signal stations will be located at one or more points on each floor, each station consisting of a bank of four 15-watt 110-volt lamps and an

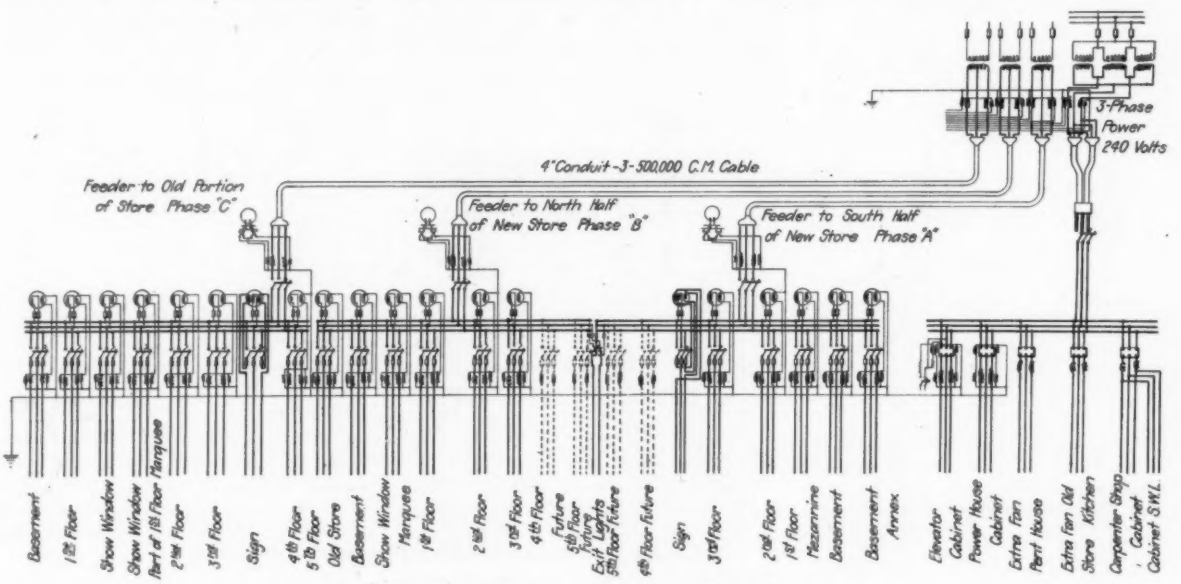


Fig. 4.—Connection Diagram for Main Switchboard.

Edwards & Company's monitor-type electric buzzer. These signals will be operated by the telephone-switchboard attendant, who will have before her the 16 push buttons indicated in the figure. Each push button corresponds to a signal, the numbers above the push buttons in the diagram showing the numbers of the lamps which will be illuminated upon pressing the corresponding buttons. The push buttons located in row *A* of the diagram are of the snap type, being similar to the push-wall switches used for the control of electric lights. Those shown in row *C* are of the momentary-contact type and are used to control the electro-magnetically controlled "Diamond H" panel-board-type switches in row *B*.

In order to simplify the diagram only one signal station is shown. Where more than one station is employed on a floor, they are connected

in parallel, while the signal circuits on each floor are connected as shown. The diagram also confines itself to the circuit of the two outer push buttons of row *A* and the left push button of row *B*, for simplicity.

When the proper button of the left momentary-contact switch in row *B* is pressed, contact is made between the upper and lower contact segments numbered *1 2* and *3* of the extreme left multipole switch of row *C*. Current hence flows from the main *M* through the bus *O*, and the contacts numbered *1, 2* and *3* at the left of row *C* to the buses at the extreme left numbered *1, 2* and *3*. Connected to these buses are wires supplying current to lamps *1, 2* and *3*. One terminal of each of these lamps is connected to the wire *P*, which in turn is connected to the other side (*N*) of the supply mains through

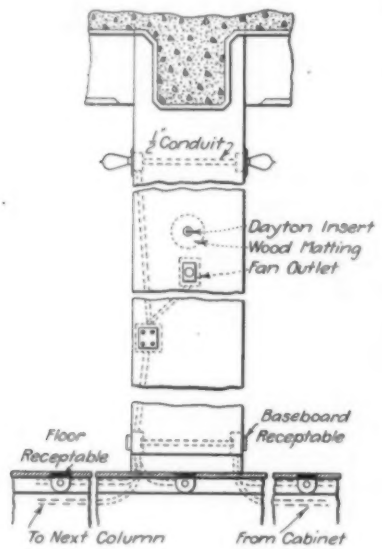


Fig. 5.—Column Wiring.

feeder *R*, thus closing the lamp circuit.

Now when current flows through the solenoid *D*, as it must when a signal circuit is closed, the solenoid-operated switch at *D* is closed, thus starting the motor driving the flashers. This flasher is used to cause an intermittent operation of the signal buzzers. When any signal circuit is closed current will flow from main *M* through push button *F*, which is normally kept in the closed position, through the contacts of the flasher to the pilot buzzer and the signal buzzer on the various floors, all of which are connected in parallel between main *N* and the push-button feeder *R*. The buzzer circuit may be opened if desired by means of the push-button switch *F*. All the circuits for this signal system are run in conduit.

In addition to the wiring thus far described, an electric clock-control system and an automatic-sprinkler alarm system with Edward & Company's electro-mechanical bells, annunciators and switches will be installed, the circuits for these systems being run in conduit as is all other wiring in the building.

At the present time the type of the main lighting fixtures to be used is undecided. About 200 Holophane DEE reflectors and drop cords, however, will be used.

During construction about 85 horsepower is being obtained from a near-by trolley circuit for the operation of motor-driven concrete mixers, hoists and pumps.

The Utah Power & Light Company's Extensive Service.

That the financial interests of the country are beginning to appreciate the prominent part which the electrical industry is to play in the development of the industrial life of the community which it serves, is clearly indicated by the June Trade and Finance Letter of the National Copper Bank of Salt Lake City, Utah. The fact that other interests outside of the electrical industry are beginning to appreciate the value of a unified system serving a wide territory in obtaining the benefit of the diversity in the use of power is also very strongly emphasized by this letter, from which the following excerpts are taken:

Ever since its organization, the National Copper Bank has argued in these trade and finance letters that the intermountain territory would ultimately be known best for its manufacturing and for its agriculture. There are solid facts supporting this argument, chief of which is our possession of practically all of the bases of manufacture and agricultural lands wide enough and rich enough to feed a far denser population than now exists anywhere in the United States, and of numerous large sources of power (both water and coal) now partially or entirely idle but of almost unlimited ultimate capacity. The business men of this territory are delighted to note the momentous developments which are being made in each of the three departments mentioned.

At the present time plans for quadrupling our coal output are under way in eastern Utah, and a similar feat as to our sources of water power is being performed by the Utah Power & Light Company. Its project is so far-reaching and there is so much significence in the manner in which it is developing its opportunities, that we think its operations deserve especial mention.

In the first place, the Utah Power & Light Company is comprehensive in its operations. The territory it intends to serve is the whole of the intermountain country, which means the major part of three great states, with fringes from three or four others—some 200,000 square miles in all. Already its service covers southern Idaho, the northern half of Utah, and, through a subsidiary, western Colorado.

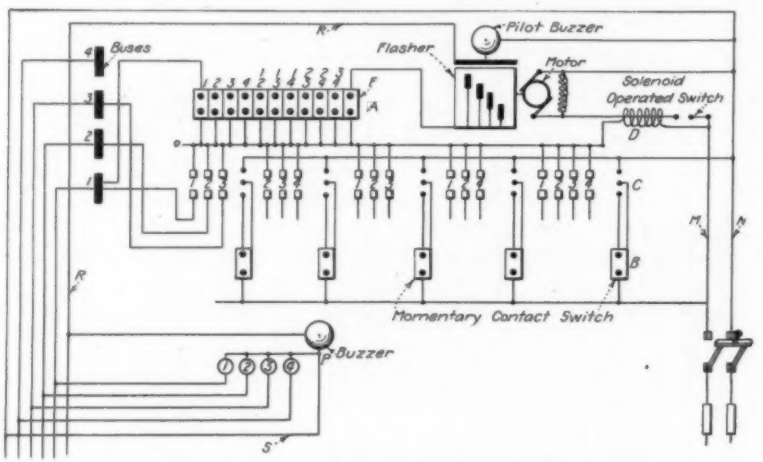


Fig. 6.—Circuits for Manager's Call System.

While the logic of events was bound in time to lead to the creation of such an organization, its immediate inception was due to the business acumen of D. C. Jackling. He is a factor in the Utah Copper Company, operating mines and mills on the west side of the valley that turn out more than 10 per cent of the annual copper output of the United States, and in so doing consume some 15,000 horsepower of energy.

He realized that the substitution of electricity for steam would show many economies, provided an absolute dependable service were established, an accomplishment only possible to an organization of great size and strength; on the other hand he knew that such a concern would not organize unless it were given advance assurances of large fixed loads. Mr. Jackling not only gave such assurances, but took a leading part in the formation of the new company.

There was a large number of towns in

this territory whose consumption of electric light and power for purely domestic uses was high. There were also canneries, flour mills, refrigerating plants and the like. These consumers were served by local power companies which had their source of supply in nearby streams and delivered energy over short transmission lines. Such companies were able to make fairly complete use of their developed power at all seasons of the year. But other power companies, possessing natural resources fully as valuable were so far from markets offering a diversified demand for power that their operations were seriously hampered. The situation required not only that profitable employment be found for all this power, but that it be made available.

Consequently the first step of the Utah Power & Light Company was the absorption and consolidation of the power and lighting concerns operating in this territory. Up to this date, every important Utah company except two, and we belive all but one of the southeastern Idaho companies have been absorbed by the larger company. One concern has been substituted for nineteen.

As these companies were absorbed, the Utah Power & Light Company proceeded with the utmost celerity to cast out all that was obsolete, and to standardize all plant and transmission equipment so as to make it possible to interchange power between the various plants. It couples together the various sources of supply, and, with transmission lines of exceptional mileage and voltage, commenced the shifting of power to the markets demanding it. Furthermore, and of greater importance, the company began the development of new markets and new power requirements.

In addition to the large volume of power consumed by the Utah Copper Company (about 9,000 kilowatts), other mining companies at Park City, Eureka, Bingham and elsewhere have arranged to change from steam to electric power. These changes came about naturally once there was in the field an aggressive concern large enough to guarantee perfectly continuous service.

In addition there are two interurban lines, a large cement plant, and many other industries, together consuming something like 6,000 kilowatts. The lighting and heating requirements of 100 towns also take considerable power, though the amount is small compared with other classes of demand.

The most interesting, however, and ultimately the most important feature, in the estimation of the company itself, is the agricultural demand.

Large pumping plants have already been installed on the shores of the Utah lake to supply the bench lands and also to maintain the normal flow of the Jordan River throughout the summer, thus providing a constant supply for the irrigation canals in Salt Lake Valley.

The pumping idea has found further application in the Cache Valley in northern Utah and in certain southern Idaho districts, where valuable lands have hitherto failed to reach their utmost productiveness because of the cost of erecting the dams and other works that are necessary in irrigation by gravity, or because of a shortage of water in the late summer. The Utah Power & Light Company has been very active in the establishment of small pumping plants for the irrigation of some of these lands. The pumping units range from 40,000-acre districts down to the 40-acre field of the individual farmer.

Not only does the company furnish the power for pumping, but in the valley of the Bear River it furnishes the water as well. To make that possible, it has undertaken extensive work at Bear Lake (a natural reservoir with a surface of 110 square miles, and lying partly in Utah and partly in Idaho), which will give to lands along the Bear River the summer use of a larger volume of water than has heretofore been available at that season.

There are many further instances of development, all made possible by the effectiveness of concentrated executive control, enlarged capacity, uniform and modern equipment, the ability to interchange power, and the increase of transmission radius.

That the Utah Power & Light Company has not arrived too soon is proven by a survey of the 100 cities and towns it serves, the 24 plants it operates, and by the fact that after assuming all the obligations of the various constituent companies (some of them in default) it has been able to reinstate them all, and, on top of that, to earn a considerable net profit in the first year of its existence. That it has opportunities before it is evident from the size of its territory, and the varied wealth that lies within it. That it is equal to the task is indicated by the energy, skill and alertness with which it has gone about the performance of its undertaking.

Proposed Bill to License Massachusetts' Contractors.

Massachusetts' electrical contractors have long felt the need for state supervision in electrical wiring and installation work. Although several attempts have been made to secure such legislation, they had failed owing to lack of co-operation and to misunderstandings among the various interests affected.

At its regular meeting in June, at Boston, Mass., the Electrical Contractors' Association of Massachusetts passed a resolution calling for the appointment of a committee of three to bring together and confer with representatives from the various interests that would be affected by license legislation with a view towards formulating a bill for licensing firms or individuals engaged in the installation of electrical apparatus and wiring, the bill to be presented at the next general court of the commonwealth of Massachusetts.

The following interests attended the conference: Special Committee, Electrical Contractors' Association of Illinois, A. J. Hixon, F. L. Barnes and R. Hallowell; Boston Board of Fire Underwriters; New England Insurance Exchange; Factory Mutual Fire Insurance Company; Massachusetts' Association of Municipal Inspectors; New England Section, National Electric Light Association; Electrical Contractors' Association of Boston; International Brotherhood of Electrical Workers; Pettengell Andrews Company; Stuart Howland Company and Western Electric Company.

The proposed action was discussed from every angle and it was voted to draft a bill, the work falling upon a special committee selected by Chairman A. J. Hixon. The conference will meet again at an early date.

Among the Contractors.

W. J. McKillip, Chicago, Ill., will install a number of lamps and a 40-horsepower motor for T. W. Keelin Company, 4553 Lexington Street, Chicago.

The Hawkins Electric Company, Springfield, O., has the contract for wiring the Grenwatt Building in Springfield. This installation will include 1,000 outlets, three elevators, an intercommuniciating telephone system, etc. All work will be installed in rigid iron conduit and a little open work employed. Three-way switches will be employed for operating the lights making the installation an elaborate one. The company is also wiring the Christian Church, Springfield, O. This installation will include the wiring and installing of 300 lights and three motors. Conduit work and semi-indirect fixtures will be employed.

Vedder Electric Company, Cleveland, O., has the contract for the electrical work in the new shops of the Cleveland Electric Railway Company. This installation comprises the work on five buildings, including an office, a machine shop, an erection shop, a wood-turning shop, a paint shop, etc. The company is at present engaged in furnishing the electrical equipment for a number of new buildings in Cleveland, among which are a large brewery, a packing house and an apartment house.

Dollar Wiring Kinks.

Every reader is invited to contribute to this column. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; and if a diagram is necessary, a rough pencil drawing will serve. The idea itself must, of course, be new and bright. A dollar will be sent to the contributor upon publication.

Removing Plaster and Cement in Conduit.

While pushing a snake in a half-inch conduit, I found that there was some obstruction in the conduit which prevented the passage of the snake. As it was not convenient to remove the conduit for inspection, I decided to pour vinegar in that section of the conduit with the hope that it would dissolve the plaster or cement that blocked the conduit. The next morning it was found that the obstruction had been removed. As soon as the conduit was dry the wires were inserted.

Samuel Gelbman.

Turning on Street Lights Automatically.

On account of our power house being several miles out in the country and the transmission line being 12,000-volt, our street lights are of necessity turned on and off at our substation in town. We have a Westinghouse regulator, or regulating transformer, formerly used for arc lights but now used on a series incandescent-lamp system. It is easy to turn off the lights in the morning by using an alarm clock to trip a weight which in falling opens the primary oil switch. But it seemed impossible to turn on the lights in a similar manner, and it has always been necessary for someone to hold himself in readiness every evening to turn on the lights. However, for the past few weeks another alarm clock has been doing it for me with perfect satisfaction. When a current regulator is switched in, it is best to have the lighting circuit short-circuited by a plug switch provided on the panel for that purpose, withdrawing this after the current has come to its proper value. So, after leaving the regulator turned on all day with the short-circuiting plug in, I found that the regulator did not run above the 6.6 amperes for which it was adjusted, neither did it heat up. Therefore, I arranged an alarm clock so it would trip a suspended weight which in turn by means of a strip of rawhide running over a pulley, jerked out the short-circuiting switch. Now I turn on the street switch before I go to supper, but leave the short-circuiting switch in, and when it comes time to light the street lights the alarm clock pulls the plug and lights the lamps.

C. W. Goddard.

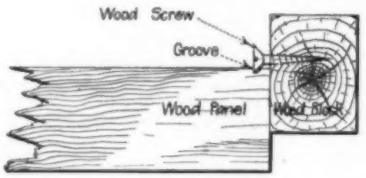
Elevator Annunciator Connections.

When connecting an annunciator cable to an elevator annunciator situated in the car, I found that I was one wire short, as both wires of the battery circuit had to go to the annunciator and I only had a seven-wire cable for the annunciator which was of the six-button type. I solved the problem by placing the batteries on top of the car.

Earl Haskins.

Cutting a Grooved Edge.

The appearance of wood surfaces can be greatly improved by grooving the surface along the edges. This can easily be done by screwing a wood screw in a block of wood, leaving the



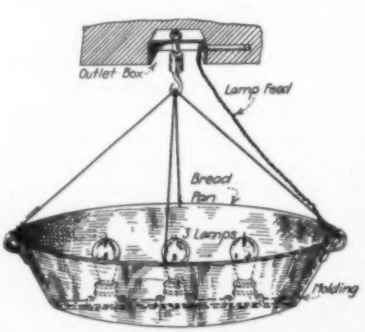
Cutting a Grooved Edge.

slot in the head of the screw in a vertical position. By running this block of wood along the edge of a wood panel or other wood surface, keeping the slot in the head of the screw at right angles to the surface to be finished, a neat groove can readily be cut as shown in the illustration.

Roger S. Enochs.

Pendent Switch for Fixtures.

I was recently called into a house where the ceiling fixtures in the parlor were capable of being controlled only



Special Lighting Fixture.

by the keys of the fixture sockets and where the fixture was mounted so high from the floor that a short person had difficulty in turning off and on the lights. Being called upon to devise some means whereby a short person could operate the lamps, I decided to place a pendent switch in series with one of the main lighting feeders of the fixture. The cord leading to the pendent switch I took out through the fixture body using a fiber bushing for the purpose. The keys on all lamps were then turned to the on position, all the lamps being controlled by the pendent switch, which hung at a reasonable height. If all lamps on a fixture are not generally used, the keys to several of the lamps can be kept in the off position, the pendent switch under these conditions controlling only the lamps the keys of which are at the on position.

A. A. Anderson.

Temporary Lighting Fixture.

I was recently called upon to install a cheap lighting fixture that would furnish the desired light to a number of decorators working on the ceiling of a large hall. The accompanying sketch shows how I solved the difficulty. Taking several large porcelain-lined bread pans, I suspended them from the regular ceiling outlets as shown. In each bread pan I placed three 100-watt tungsten lamps, the wires in the bread pans being run in wooden molding as shown. This made a cheap and efficient fixture for the purpose.

M. J. Moriarty.

Solving a Ceiling-Fan Difficulty.

I recently had occasion to install a ceiling fan in the entry way or vestibule of a bakery. The vestibule was located inside of the store, its ceiling being a few feet distant from that of the room. The fan was installed to keep out the flies. As the ceiling of the vestibule was only nine feet high, the fan had to be located very close to the ceiling in order to clear an inwardly-swinging screen door. This I accomplished by removing all the lengthening pipe and casing from the fan, and securing the shortened fan fixture to the ceiling by boring a hole through the ceiling and securing the fan by means of washers and nuts. However, it was found that the fan was not very effective owing to its closeness to the ceiling. I, therefore, bored a number of one-inch holes in the vestibule ceiling, locating them about 2.5 inches apart. In this way air passages were provided between the store proper and the vestibule. The fan is now as efficient as one installed several feet from a ceiling. Moreover, the fan now acts also as an exhaust fan, the upper air in the store, being drawn through the holes in the vestibule ceiling through the action of the fan.

P. A. Robbins.

Public Service Commissions

Conducted by William J. Norton

CALIFORNIA.

The San Joaquin Light & Power Company was granted additional time in which to issue $1,776,000 of bonds which it proposes to pledge as security for certain two-year six-per-cent collateral trust notes. The company was authorized to issue promissory notes in the sum of $249,967.13 to renew other notes outstanding. Steps are being taken to pay off a floating indebtedness of $1,615,661.13 and to provide funds for new construction.

INDIANA.

Court Decision. The suit brought in the Circuit Court to declare the street-lighting contract between the city of Indianapolis and the Merchants' Heat and Light Company illegal and void for the reason that the Public Service Commission and not the municipality has the exclusive right to fix the rates to be charged for the service in question, has been dismissed. The Court decided that the city had the right to enter into a contract with the company for the street lighting but that the fixing of the rates was wholly within the power of the Commission regardless of the contract. The court says:

"The power and duties of the commission are fixed by law. Parties cannot by contract deprive the commission of its powers and the exercise of its duties under its powers. The Commission cannot be deprived of its power over rates, the establishing or fixing of the same and the changing thereof as provided under the act, because the parties have agreed upon rates. . . .

"If the Commission is not deprived of any of its power in the matter of fixing rates, then it would seem that the provisions of the contract fixing rates would be simply surplusage and at best nothing more than advisory to the Commission."

MASSACHUSETTS.

Public Service Commission. Judge John F. Meaney, secretary to Governor Walsh, was appointed as a member of the Public Service Commission to succeed George W. Bishop.

NEW YORK.

The New York Edison Company. The Appellate Division has overruled a decision of the Public Service Commission concerning the obligations of lighting and power corporations toward the public. The complainant in the case before the Commission had applied to the New York Edison Company for electric lighting and power service. He had previously contracted for electric service during certain hours from a private generating plant, and in making out the company's standard forms of contract he struck out the clause forbidding the use of other electric service without the written consent of the company. The company refused to grant him service under such an agreement. Upon appeal to the commission, the company's stand in the matter was upheld. The court has now decided that, in consideration of the privileged position of the New York Edison Company, not the least of which is the right to use the public streets, and highways for carrying its conduits, it is bound to serve impartially every member of the community who demands its services. It may, the court acknowledges, establish reasonable regulations, which the consumer must observe, but the requirement that a consumer must take all his electricity from one company or receive none "is not in any proper sense a regulation respecting the use of the service, but is a purely arbitrary attempt on the part of the company to insure to itself a monopoly of furnishing electrical current." If that were permissible, the Court points out, the company could also refuse to furnish current to a consumer who was manufacturing for himself part of the current he needed, and this had already been severely condemned upon grounds of public policy. Moreover, if the company had established the fact that the hours during which the supply of current would be used were those in which the greatest demands were made upon its services, this condition could have been met by making a special rate for the service. The case was returned to the Commission for reconsideration.

The Naussau Light & Power Company. The Second District Commission has issued a decision in which it reiterates the important principle that corporations must be protected from undue competition when subjected to regulation by the Commission. The Glen Cove Light and Power Company applied for authority to exercise a franchise granted by the Village of Sea Cliff. This company proposed to supply Sea Cliff with current at nine cents while the Naussau Company was furnishing current in the village at fifteen cents. The Commission stated that there was no certainty that the company could continue to furnish service at that price and found that duplication of service was not desirable. The Naussau Company stated that if approval of the franchise was withheld it would reduce the general maximum rate to 12 cents. This reduction was authorized and the company protected from competition.

OHIO.

Proposed Telephone Merger. The Commission has been asked to grant the authority to organize the Ohio State Telephone Company, a merger of 15 independent companies. The companies interested have $20,616,200 capital stock; total liabilities of $25,568,926, which it is proposed to decrease by $4,952,726.

The Youngstown & Sharon Street Railway Company was authorized to purchase the property of the Youngstown Consolidated Gas & Electric Company for a consideration of $4,380,000.

The Akron People's Telephone Company was authorized to issue and sell at par, on or after December 1, 1915, $380,000, seven-per-cent cumulative-preferred stock. The proceeds are to be used to pay $380,000, six-per-cent bonds which mature January 1, 1916. The Commission refused to authorize an additional issue of $370,000 preferred stock for additions and betterments.

WISCONSIN.

The Manitowoc Municipal Water & Light Plant was ordered to put in effect a minimum bill for electric service and to place in effect a reconnection charge to temporary consumers, such charge to be based upon the amount of service which the consumer has previously taken. The Commission found that the city was not placing in effect a rule made in a previous decision in which the city was ordered to install water meters or pay rental to consumers owning such equipment.

Questions and Answers.

All readers of the Electrical Review and Western Electrician are invited to submit questions and answers to this department. Full names will not be printed except where the writer indicates his willingness therefor. Anonymous communications will not be considered. Questions relating to electrical matters of any kind will be inserted. Answers from our readers should be received in this office preferably within ten days of the date of publication of the question, and will be published in a subsequent issue. Payment will be made for all answers published.

Questions.

No. 229.—Liquid Air for Ice Making.—Has liquid air ever been used in place of ammonia in commercial ice-making plants?—W. R. T., Fort Wayne, Ind.

No. 231.—Short-Circuit on Induction Motor.—What is the simplest way to test an induction motor for short-circuit in the coils? Does a short-circuit usually burn the coil out entirely?—H. E. M., Galesburg, Ill.

No. 232.—Simple Intercommunicating Telephone.—Is it possible to wire a simple telephone onto an ordinary buzzer or bell circuit between two offices about 180 feet apart in the same factory building? If so, how can it be done? Is it possible to talk both ways or only one way?—N. D. J., St. Louis, Mo.

No. 233.—Life of Vehicle Batteries.—Some 15 years ago the average life of a storage battery used in an electric vehicle was only one year. What is regarded as the average life now of a high-grade battery in vehicle service of medium character, that is, between that of a heavy truck and a light pleasure car?—E. P., Chattanooga, Tenn.

No. 234.—Vertical Electric Sign.—In the case of a vertical electric sign of box section, about one foot square and about 12 feet high, that is to be mounted on the corner of a hotel building and have lettering on all four sides so as to be easily read from any direction on the intersecting streets, how should the lamps be arranged to get all parts of the letters uniformly lighted and yet use a minimum number of lamps?—C. L. T., Brooklyn, N. Y.

Answers.

No. 218.—Panama Canal Locomotives.—What reasons were considered for adopting the very low potential of 220 volts for the towing locomotives for the Panama Canal? Why was three-phase current chosen instead of direct current, which has many advantages as long as high voltage was not to be employed? Why are two very heavy and costly copper "third" rails used as contact lines? Why is the rack-rail construction such a one as to take hold of the rack pinion?—A. G., Wilkinsburg, Pa.

The principal reason for the use of 220 volts on the towing locomotives is that this potential was adopted as a standard for all operating equipment of the locks. The use of direct current would have necessitated the installation of substations with attendants. The use of copper for the "third" rails made it unnecessary to use costly and bulky feeder cables; the use of copper for the "third" rails was less expensive than the same installation with the use of steel rails as conductors. The rack-rail construction adopted provides for the use of two guide wheels, one upon each side of the rack, which are used in order to prevent the overturning of the locomotive when the tow-line pull is at an angle to the path of the locomotive travel; the rack pinion travels in the rack in a similar manner as is ordinarily the case in any rack railway.—E. S., Culebra, Canal Zone.

The hot climate (about 95 to 100 degrees Fahrenheit the larger part of the year) and especially the moist atmosphere at the canal level makes insulation of any kind short-lived; the use of 220 volts gives the ample margin of safety necessary to insure continuity of service. Three-phase current was selected on account of the suitability of three-phase induction motors for the service; this consists of operating the cable reel at certain specified speed limits, and secondly, operating the locomotives at a certain definite speed regardless of load. The high currents required by these locomotives require a very-low-resistance conductor to avoid excessive voltage drop. The rack rail and pinion is only used on the steep inclines at the locks where it would be impossible to ascend otherwise, and extremely dangerous to descend; these inclines run as high as 26 feet rise in 100 feet.—E. F. B., Auburn, Me.

No. 227.—Rewinding Another Motor.—I have a General Electric one-sixth to one-eighth horsepower, 110-volt, direct-current motor, whose armature core is 3.25 by 3.25 inches and has 12 slots. The commutator has 24 segments. The original armature winding has 150 turns of No. 31 wire; the fields have 550 turns of No. 28 wire. I want to rewind it to run on 120-volt, 60-cycle, single-phase circuit. What size wire and how many turns must be used on the fields and armature?—W. T. E., Ansonia, Conn.

Inasmuch as the motor in question no doubt has a cast-iron field core, it would be impossible to rewind it for alternating current and make it work efficiently. It might be wound and run as a series motor, but even though the armature might rotate, serious heating would develop with little, if any, power. Series motors, when run on alternating current, have laminated field core, are bipolar, and develop very high speed.—G. W. C., Roslindale, Mass.

No. 228.—Panelboards.—Are panelboards made in which the three leads are 110-volt three-phase and all the branch circuits single phase, being evenly divided among the three phases? If such a panelboard is not on the market, could one be built with a four-wire, three-phase main, the single-phase branch circuits being connected between the three outer wires and the neutral?—J. B. E., Evanston, Ill.

Panelboards for 110 volts, three wire, three phase are not stock articles but can be readily built by any panelboard manufacturer. The writer has had such panels built and installed. The same observations apply to three-phase, four-wire panels. The city of Sacramento, Cal., uses a three-phase four-wire system supplied either by the Pacific Gas & Electric Company or the Great Western Power Company. On all large installations the distributing system in the building is designed for three phase, four wire and all phases must be balanced within ten per cent. The Sacramento County Court House employs these panels and the California Fruit Building and Empress Theater also uses the same system. The two latter installations were designed by the writer and we found no trouble in obtaining panelboards to suit these conditions. Care must be exercised in keeping corresponding polarities together, especially where public lighting circuits are bussed separately on the same panel. Standard three to two-wire panel switches with lengthened cross-bars to accommodate the neutral bar were used. The spacings between the bars except to the neutral bar must be designed for 250 volts. Needless to say perfect balance cannot be obtained between phases unless the total number of circuits is divisible by three. In this connection it may also be noted that the Panama-Pacific Exposition's distributing system is three phase, four wire and for all loads 25 kilowatts and over the feeders to the centers of distribution are all required to be three phase, four wire.—M. C. H., San Francisco, Cal.

I do not think that panelboards for three-phase to single-phase distribution are listed in any catalog, but it would be no trouble to have same made. On numerous occasions I have had similar problems in panelboard construction and have made a drawing to scale, following the National Electrical Code in regard to spacing of parts, carrying capacity of busbars, etc. Use the standard panelboard switches, etc. This drawing should then be sent to various panelboard manufacturers who will give you an estimate on the cost of same.—C. T. P., San Francisco, Cal.

No. 230.—Voltage of Rural Lighting Plant.—Is it better to use 32 or 110 volts for a small gasoline-engine-driven lighting plant on a farm 20 miles from the nearest electric station? There is a possibility that transmission line may be built within two years so as to pass about half a mile from the farm house.—B. L., Fargo, N. D.

It would be better to use 110 volts for

the following reasons: (1) It is assumed that the number of candlepower will be the same under either voltage, which means that the number of watts will be the same. Watts are the product of volts and amperes. Therefore, it is obvious that at the lower voltage a correspondingly larger amount of current will have to be delivered by the generator and carried through the wires to the lamps. This would require larger conductors at greater cost. The larger conductors would be required not solely because of the larger current, but in order that the drop in voltage between the generator and the lamps might not be excessive. The drop in volts is, of course, the product of the current times the resistance of the conductor. While the larger conductor would offer less resistance the current would be correspondingly greater. However, a drop in volts which would be satisfactory for 110-volt distribution would be entirely too much for a 32-volt system. The drop on a 110-volt basis might run from two to four volts, depending on the load, without seriously affecting the brilliancy of the lamps, but a drop of this amount in the case of 32 volts would have a noticeable effect on the illumination. Therefore, to meet this condition at 32 volts, wires of considerable size would be necessitated, if more than a very few lamps were used or if the run from the generator to the load were more than a few feet. (2) Lamps designed to run at 32 volts are special and would cost more per candlepower than lamps designed for 108 to 110 volts. (3) It is noted that there is a possibility that a commercial lighting line may be built in the near future from which it may be desired to take current. Wiring the plant now for 110 volts will be much more likely to meet the conditions if the supply is ever taken from the commercial mains, as with 32-volt lamps and wiring arranged therefor it would be necessary either to secure a special transformer or to change the lamps at that time to 110-volt lamps and sacrifice a large portion of the investment in wire since, as pointed out above, it would be much larger than would be needed for 110-volt distribution.—H. S. P., Bloomfield, N. J.

In the case of selecting a voltage to operate lights or for any purpose it is always well to select a voltage that is considered standard. While incandescent lamps and generators can be obtained for 32 volts, it would seem in this case that it would be best to install a 120-volt system as there are possibilities that the transmission line will be built in the vicinity soon. If storage batteries are to be used in connection with this installation, then the lower voltage will not require as an expensive battery as the higher and for this reason numerous small plants have been installed using 27 to 32-volt lamps. However, 120 volts is practically standard for all kinds of household electrical apparatus, such as electric irons, toasters, small motors, vacuum cleaners, coffee percolators, fans, etc., and these articles are not being built for the lower voltage.—C. T. P., San Francisco, Cal.

The meager details regarding the exact size of the proposed plants, and other conditions which are not given in the question, make it impossible to give exact data in reply. However, I would say on general principles, that it would be a mistake to install a 32-volt plant if there is any likelihood of getting regular central-station service, and it would be a mistake under any circumstances unless it be for a very small domestic lighting system. It is almost as much a financial problem as an electrical one. One must consider the possibility of disposing of the outfit when superseded, as well as first cost and efficiency of operation. In such a plant almost everything would be special. The only reason for the proposal that I can think of is possible saving in first cost of a battery, should one be used, because this would require only 16 cells. It must be remembered, however, that with such a low pressure as 32 volts, that all wires and fittings must be much larger than with 110 volts; that it will be very wasteful to transmit power even a few hundred feet; that the lamps could not be used on the higher voltage, if service from the power company is later secured, which prohibition also applies to motors or other applicances, if any are installed. In short, the whole plant except wiring, would have to be scrapped and the 32-volt apparatus, including the dynamo, not being standard voltage would bring only the price of junk as there would be little or no market for it as electrical apparatus. On the other hand with a 110-volt plant, the incandescent lamps could be used on the alternating-current lines; the 110-volt direct-current motors and dynamo would bring a fair price second-hand, or the dynamo, engine and switchboard could be retained and used to carry the lighting load when the central-station power service might be disabled, or at any other time desired.—H. A. C., Pittsburgh, Pa.

The most practical and cheapest plant is the low-voltage plant, because with a 32-volt plant you need only 16 cells of storage battery. A battery is practically needed because you do not want to run the engine and dynamo at night. For farm-lighting plants 32 volts is now standard and at least four companies I am acquainted with manufacture or furnish such plants complete. You cannot depend on the power company supplying a few widely scattered farm houses from high-tension lines, unless it is to put up a special farm service circuit, which it probably will not do unless all your neighbors agree to take the service from the company.—C. S. K., Grand Rapids, Mich.

Magnetochemical Phenomena.

In an article in the *Physikalische Zeitschrift*, A. Schukarew describes some experiments which indicate the existence of an electromotive force produced by subjecting certain reacting chemicals to a magnetic field. A mixture of solutions of ferric chloride and potassium iodide had two platinum electrodes dipping into it and the latter were connected to a galvanometer. If the solution is placed between the poles of an electromagnet in such a position that the platinum electrodes are normal to the magnetic field, there is no effect, but if the electrodes are parallel to the field and unsymmetrically placed, so that one of them is subjected to a stronger field than the other, an electric current is produced which flows from the electrode in the stronger field through the galvanometer to the electrode in the weaker field.

The electrodes in the above case were exactly similar. When there is no magnetic field a current can be obtained only by having one electrode of larger area than the other, in which case a current will flow from the larger to the smaller electrode.

Similar effects were obtained with other reacting chemicals, such as a mixture of chromic oxide, sulphuric acid and potassium iodide.

Making Peat Available as a Fuel by Drying.

A process for drying peat, which promises to be of great commercial utility, has been invented in Newcastle, England. The process is now in use in County Kildare and on the Lochar Moss at Rachs in Ireland and near Dumfries in Scotland. The results so far are claimed to be of a gratifying character, and strengthen the hope of making peat a commercial commodity.

Peat is a spongy substance, composed generally of mosses and aquatic plants in different stages of decomposition. It covers about 2,831,000 acres of Ireland, one-seventh of the entire surface of that country, and the deposits in the gross are estimated to contain 39,972,000,000 tons of fuel of the value of $4,250,000,000. Scotland possesses great deposits of peat, and in England and Wales there are some 6,000,000 acres of deposit.

Important Contract Between China and Marconi Company.

The Marconi Company announces that its contract with the Chinese Government for the establishment of wireless stations in China has been filed at the British legation awaiting signature. China authorized the Marconi Company to issue $10,000,000 of five-per-cent Chinese bonds in payment for the proposed stations.

National Electrical Contractor's Association.

Annual Convention, Detroit, July 14-18.

The fourteenth annual convention of the National Electrical Contractors' Association was held in Detroit, Mich., July 14-18, the headquarters of the convention being at the Cadillac Hotel. The convention was the most successful and best attended one ever held by the association, there being 210 members present and over 215 guests. Much was added to the success of the convention by the general feeling of goodwill and fellowship that existed to an extent seldom present at any convention. As a result the members benefited not only from the numerous sessions but also from the experiences of others as told during friendly conversations between sessions and during the various entertainment and recreation features.

Opening Sessions.

On Tuesday, July 14, a meeting of the Board of Directors and the Executive Committee was held after which a 45-mile automobile trip and supper were enjoyed.

At 10 a. m. on Wednesday, July 15, the convention was called to order by Past-President E. McCleary, who, after a few introductory remarks, introduced John C. Gillespie, police commissioner of Detroit. Mr. Gillespie welcomed the convention to the city and mentioned the value of co-operation and association. In concluding his remarks he presented to Ernest Freeman, the president of the association, the gold key to the city.

President Freeman accepted the key to the city, thanking the city of Detroit for its welcome. Mr. Freeman then briefly reviewed the activities of the association telling of improved credit conditions that had largely resulted from the association's efforts and mentioning the association's aim to reduce fire and life losses as a result of defective wiring, etc. President Freeman then turned the meeting over to Past-President McCleary, of Detroit, saying that Mr. McCleary's acquaintance with the speakers made him the proper chairman.

Past-President McCleary then introduced John Trix, of Detroit, vice-president of the National Manufacturers' Association. Mr. Trix emphasized the value of associations, of figuring on overhead expenses and of maintaining a high standard of work. A good contractor, Mr. Trix said, is one who is not afraid to refuse a contract offered under questionable conditions or by questionable parties. Mr. Trix then advised contractors to take an interest in politics saying that by politics he meant the nation's welfare. Comparing the prices of foreign and American-made goods, he showed that although foreign-made goods may in cases be cheaper, the foreign mechanic does not enjoy the luxuries and even some of the necessities of his American brother. Patriotism, Mr. Trix emphasized, meant buying American products.

W. N. Matthews, of St. Louis, Jupiter in the Jovian order, then delivered a 15-minute talk on "Jovianism." Mr. Matthews said that the membership of the Jovianian order includes all phases of the electrical industry and that membership in the society increased brotherly feeling among men engaged in all branches of electrical work. An employment bureau is maintained and money is loaned to deserving parties. At present a correspondence school teaching various electrical subjects is under consideration.

Workman's Compensation and Employer's Liability.

John E. Kinnane, chairman, Michigan Industrial Accident Board, then delivered an address entitled, "Workman's Compensation and Employer's Liability." Mr. Kinnane stated that at the present time about 23 states have compensation laws. Although these compensation laws are of substantially the same nature, they differ widely from the viewpoint of the employer. All compensation laws, he says, are based on the theory that the expense of accidents should form part of a firm's operating expense. Considering the Michigan law, Mr. Kinnane stated that it had been in force for two years. Under this law both the employer or employee are given several choices The employer's liability is fixed at one-half of the employee's wages and the employer may insure in a liability company approved by the Industrial Accident Board; may organize a mutual insurance company with the co-operation of other employers; may insure in the State Insurance Department, or, if financially able, he may carry his own risk. Although liability-insurance companies first charged high rates, a substantial reduction in rates was caused by the organization of a state insurance department. A differential rating of risks has recently been developed by the liability-insurance companies, the standard rate applying to the average well equipped organization and lower or higher rates being given for organizations differing from the standard in either direction. In concluding Mr. Kinnan emphasized the fact that it is the duty of every employer to instruct and warn new men of the dangers incident to their work.

Remembrances Presented to Ernest Freeman and E. McCleary.

At the conclusion of the morning session, Past-President McCleary, on behalf of the Michigan Association, presented to President Freeman a handsome gavel with the following inscription:

1912-1914.
Ernest Freeman.
Your work as president of the National Electrical Contractors' Association is appreciated and admired by the Michigan Electrical Contractors' Association.

Following the remarks of Mr. Freeman upon the receptance of the gavel, W. Turner, of Detroit, presented Past-President E. McCleary with a cut-glass water set, the gift of the Detroit contractors.

Wednesday Afternoon's Session.

The afternoon session opened with an address by T. I. Jones, of the Brooklyn (N. Y.) Edison Company. Mr. Jones called attention to the value of the Salesman Handbook, published by the National Electric Light Association, and to other features of the association work reviewing rapidly the report of the National Electric Light Association's Committee on the Wiring of Old Buildings. Mr. Jones then gave a brief outline of the policies of the Brooklyn Edison Company. He stated that the company uses the phrase, "Wire your living room for $49," in its various advertisements. This phrase he said is only used as a means for securing business, very few people being content with a $49 installation. The wiring of all buildings is done by contractors, the Edison Company often financing installations for light or power and securing its payment on the partial-payment plan. Carbon lamps and tungsten lamps of 60 watts rating or over are renewed free. Appliances are sold by the central-station company only as advertising features, the price of such articles being the same as that fixed by the Kilowatt Club of Brooklyn and the trade in general. When special sales are conducted, the decreases in price are made by the manufacturers of the advertised products. When such sales are conducted contractors are given the benefit of the manufacturers' reduced prices, the central-station company selling the appliances to contractors at cost plus a five-per-cent charge for handling. In this way the company recently sold

1,200 toasters and the contractors 700 toasters. In concluding Mr. Jones advised electrical contractors to use modern merchandising methods in the sale of appliances paying due attention to the creation of desire to buy.

J. A. Fowler, Memphis, Tenn., asked if appliances were sold on the installment plan and was told that such was the company's policy.

F. M. Grant, of Cleveland, O., then asked Mr. Jones if he stated that carbon lamps and tungsten lamps of 60 watts rating and over were renewed free.

When Mr. Jones answered in the affirmative considerable discussion took place, many thinking that lamps ought to be sold by contractors. Mr. Jones said that he believed Brooklyn contractors were well satisfied with the present policy of the company, but that conditions in all cities are not the same. Speaking of free renewals of tungsten lamps, Mr. Jones stated that the price of the 60-watt lamp was such that a tungsten lamp of that size or over fell within the allowance made by the company for the renewal of carbon lamps.

A closed session was then held during which various committee reports were presented.

Protection for Conduit Threads.

On Thursday morning the subject of protection for conduit threads was considered. This subject was first brought to the attention of the association by R. G. Littler, Portland, Ore., who stated that the threads on conduit received in his state were always so battered through shipment that each length of conduit had to be rethreaded at considerable expense. At the 1913 convention a committee was appointed to take the matter up with conduit manufacturers. Manufacturers claimed that protecting the threads on lengths of conduit would increase the price of conduit by about 2.5 per cent. One manufacturer is now manufacturing conduit the threads of which are protected during shipment by a cap of fiber which can easily be removed. To show its appreciation the association passed a resolution in which it thanked manufacturers for the work which they have done in this connection.

National Electrical Code.

E. McCleary presented the report of the committee on the National Electrical Code, giving a history of wiring methods and code regulations. He cautioned all contractors in regard to the wiring for the new 1,000-watt gas-filled lamps, the load represented by one of these being greater than that allowed on a circuit by the rules of the National Electrical Code. In concluding Mr. McCleary made reference to a paper by M. K. Foxworthy, of Indianapolis, Ind., which was the next paper on the program. Mr. McCleary thought that the association and its individual members should do all in their power to decrease the multiplicity of material as recommended in Mr. Foxworthy's paper in which the subject or the double-braid and single-braid wire was considered.

Double-Braid Versus Single-Braid Wire.

M. K. Koxworthy, of Indianapolis, Ind,, then presented a paper in which he urged the association to discourage the manufacture of single-braid wire, and to adopt double-braid wire as standard for all work. Considerable discussion followed, one of the main objections raised being that the use of double-braid wire would increase the cost of wiring small cottages. However, it was pointed out that the removal of the necessity for maintaining two stocks of wire with the consequent probability of mixing stocks with costly results and that the reduction in price due to discounts in large quantities more than outweighed this objection. A contractor doing a small business said that he could save one per cent per month on his wire bill by using only one stock. Others figured that the cost of wiring a small cottage would be increased only about $1.00 on the basis that No. 14 wire were used. The association passed a resolution favoring double-braid wire and recommending its use exclusively.

The association adopted as standard the N. E. C. A. wire and conduit charts.

Date of Meeting Made Flexible.

Several changes in the constitution and by-laws were made, the most important change being one which gives flexibility to the date of the annual convention. In place of being fixed as at present, the date of the annual convention may be chosen between the dates June 15 and October 15.

Central Stations and Contracting Conditions in Foreign Lands.

The afternoon session on Thursday, July 16, opened with an address by S. E. Doane, chief engineer, National Lamp Works of General Electric Company entitled, "Observations of Central Stations and Contracting Conditions in Foreign Countries." In this address Mr. Doane paid particular attention to electrical contracting conditions. Most of Mr. Doane's time abroad was spent in Germany and Italy, where he found that the small customer was a source of profit to central stations. As a result of the co-operation existing being European contractors and central stations much progress has been made in the wiring of small houses. Flat rate systems are in general employed and every effort made to keep down the cost of bookkeeping. An inexpensive system of wiring is employed and all soliciting in Germany at least is in the hands of the electrical contractor. The cost of wiring is added to the lighting bills in some cases being spread over a period as long as 10 years. Numerous stereopticon views showed that a very simple and inexpensive type of wiring is employed. Concentric or metal-covered wire is extensively used, the wire being laid in grooves cut in the plaster with a handy tool. This construction is partly due to the fact that space for wires is hardly ever present between the outside and inside walls of the average German house. Exposed wiring, molding and lead-covered wire are used in connection with many installations. Small and cheap current-limiting devices are employed. Considerable data on European Central-Station practice were given in our issue of January 24, 1914, in connection with a paper by Mr. Doane presented at the Wisconsin Electrical Association's meeting at Milwaukee and in our issue of May 30, 1914, in connection with a paper by Mr. Doane which was read before a convention of the commercial men of Ohio central stations.

Mr. McCleary asked Mr. Doane to tell of fuse, receptacle and color practises in Europe.

Mr. Doane explained that the Germans so construct their fuses and receptacles that only the correct fuse will make proper contact, the width of the fuse elements varying directly with the current and the length with the voltage making the substitution of a fuse of different rating impossible. Colors are used to indicate the capacity of fuses, the color for any fuse being the same as that used on a postage stamp the cost of which in pfennigs is the same numerical quantity as represents the capacity of a fuse. Mr. Doane explained that colors are extensively used in connection with electrical work in Germany.

M. L. Barnes, of Troy, N. Y., asked if the metal-covered wire referred to had been approved by the Underwriters Laboratories. Mr. Doane replied that no such approval has as yet been given.

Mr. Barnes moved that a committee of three be appointed to co-operate along the lines suggested in Mr. Doane's paper.

Thursday Afternoon's Closed Session.

At the closed session the recent resolution of the American Institute of Architects passed at its New Orleans, La., meeting in which the segregation of electrical work was recommended in all bidding, was discussed together with bill No. 14288 now pending in the House of Representatives. This bill covers the segregation of

electrical work on all government work in which the total cost is below a certain maximum. A resolution was passed in favor of the bill.

George H. Hill, the special representative of the association, then presented his report covering his work in the Middle West and Southern states.

Report of Committee on Legislation.

The report of the Committee on Legislation was one that represented months of hard work upon the part of the chairman Paul H. Jaehnig and the members of the committee. This is a 98-page report which covers existing state laws, proposed state laws, existing city ordinances and proposed city ordinances. This report which is furnished free to members should prove of great value to all contractors interested in securing state laws or city ordinances governing electric wiring. The association showed its appreciation of the work of Mr. Jaehnig and his fellow workers by a rising vote of thanks and by a resolution of appreciation.

Code of Ethics.

At this convention the association passed its first code of ethics which states that members of the association shall regard themselves as engaged in a business in which there is a well defined duty and obligation towards the public and themselves and shall refuse to engage in or encourage any practices contrary to law or to rules and regulations safeguarding life and property. Under this code a member cannot assist unqualified persons to evade laws or furnish estimates to general contractors who do not regard such bids as final and binding without being looked upon with at least disfavor. Although members shall not falsely or maliciously injure the reputation, prospects or business of a fellow member, it is a member's duty to expose without fear or favor, corrupt or dishonest conduct and practices of his fellow members. The code also provides that members shall not attempt to supplant a fellow member after definite steps have been taken towards his employment or towards the letting of a contract to him. A member shall in no way interfere with the carrying out of a fellow-member's contract. The code provides that disputes and differences between members shall be submitted to the arbitration of two disinterested members, and in failure to arrive at a conclusion, to three members, the third being appointed by the president and the decision of the majority of this commission being held binding.

Liability Insurance.

The important subject of liability insurance was brought before the convention at this time, by E. J. Burns, secretary and treasurer of the electrical contractors' association of Illinois and Iowa. Mr. Burns first rapidly reviewed the work which he had accomplished as secretary of the Illinois and Iowa associations, a detailed description of which work was given in our issue of June 27, 1914, in connection with Mr. Burns' address before the June meeting of the Illinois electrical contractors' association at Danville, Ill. In brief Mr. Burns found that electrical contractors were paying as high as $2.00 per $100 of payroll for liability insurance covering both the public and employees, but was able to obtain a rate of $1.00 per $100 of payroll for the same type of insurance from a large risk company, thus effecting an average saving of $70.36 to those contractors who had taken advantage of the rate. In this way Mr. Burns effected and put in operation a plan whereby liability insurance of the members of the two state associations could be written at a great saving to the members in a company that is without question competent to furnish the protection and service.

Considering the rate of $1.00 per $100 of payroll for insurance covering compensation and public hazard, Mr. Burns stated that records showed that the hazards of the electrical business were practically a minimum. Realizing the profit that stock companies are making and wishing to secure this profit for the members of the association, Mr. Burns said that it is proposed to organize a company from among the members of the association to write the compensation insurance of the members of the 24 states under such laws and the liability of members in the other states. Such organizations have been effected by the metal trades, printers, master builders, etc., with successful outcomes. After conference with insurance experts, Mr. Burns recommends that the organization be effected under the laws of Illinois, which seem best adapted to this purpose. This law requires at least 30 applicants for a charter, and at least 25 applications for insurance covering a payroll of not less than $2,500,000 and premiums of not less than $15,000 before the company shall proceed with business. Policy holders are members of the corporation and all directors and officers excepting underwriting managers and secretaries must be chosen from members of the company according to the Illinois law.

The following risks to be undertaken by the company were recommended: workmen's compensations, employee's liability and public liability. The business of the company would be under the immediate direction of a board of directors elected annually from among the policy holders and the company would be subject to the direction and regulation of the Illinois insurance department.

It was recommended with reference to contingent liability, that the company obtain a guarantee that the annual premiums charged will be suffi-

Group at Convention of National Electrical Contractors' Association—Left Hand.

cient to pay in full all losses and expenses of management for each year's business. This can be done for a small percentage of the premium and should be pursued until a sufficient surplus warrants its abandonment.

This proposed company would be organized as a mutual company, such an arrangement being made with a guarantee company having a capital of $1,000,000. The company would hence be as safe as a capitalized company but at the same time would return the profits to the policy holders offering the best form of protection, the most economical operation and the lowest cost of insurance.

This report was adopted and referred to the directors at their Saturday meeting. At this meeting the report was referred to the executive committee with full power to act, the executive committee intending to take the matter up at the next quarterly meeting in Indianapolis.

C. L. Eidlitz, the first president of the association was made an honorary member having retired from the electrical contracting business.

A telegram was received from J. R. Wakeman, extending the greetings of the National Electric Light Association.

Charm Presented Ernest Freeman.

Ernest Freeman was presented with the official charm of the association. The charm is of pure gold bearing on one side the genius of electricity and on the other side the official seal of the association

At a breakfast Mrs. E. McCleary was presented with a gold-handle umbrella inscribed "To Our Mother." It was the gift of the association.

Election of Officers.

The following officers were elected: President, John R. Galloway, Washington, D. C.; first vice-president, T. C. Hatzel, New York City; second vice-president, W. L. Hutchinson, Kansas City, Mo.; third vice-president, John C. Render, Los Angeles, Cal.; treasurer, James Hilton, Syracuse, N. Y.; secretary, G. H. Duffield, Utica, N. Y., and sergeant at arms, J. C. Sterns, Buffalo, N. Y.

Three enthusiastic cheers were given for Mr. Galloway and short speeches were made by the various officers.

San Francisco Next Place of Meeting.

San Francisco will be honored as the meeting place of the convention in 1915. New York City was selected for the year 1916.

On Saturday a meeting of the Board of Directors and a meeting of the Executive Committee were held.

Entertainment Features.

On Wednesday, at noon, a complimentary luncheon was given by the Detroit Jovian League. Speeches were made by Messrs. Griffin, Freeman, McCleary, Matthews, Niesz, Strong, Hobson, Hill and Fowler. Statesman Griffin presided, and R. S. Stearns was toastmaster.

A card party on Wednesday afternoon and a theater party in the evening were arranged for the ladies.

The Jovian order held a rejuvenation on Wednesday evening.

The annual dinner of the association was held at Hotel Cadillac on Thursday evening. L. W. Eddy presided. Harold Jarris rendered numerous vocal selections. E. McCleary, John Trix, R. S. Stearns, J. A. Fowler, and Ernest Freeman spoke.

Friday was devoted to recreation. In the morning over a hundred automobiles carried the members of the association and the guests through the city and the nearby country. In the afternoon and evening a boat trip to Bob Lo island was enjoyed, supper being taken on the island. Dancing was enjoyed on the trip to the island and a minstrel show and vocal selections were enjoyed on the return trip.

Special Illumination.

A large electric sign welcoming electrical contractors to the city was displayed on the city hall. A novel feature was the flood lighting of the Dime Bank Building, three sides being illuminated by gas-filled lamps and parabolic reflectors located on buildings distant 100 to 250 feet. About 75 kilowatts were employed for this purpose and the building could be seen at a distance of 10 to 12 miles at night.

Exhibits.

The following firms had exhibits, numerous other firms having representatives present: Western Electric Company, Sprague Works of General Electric Company, General Electric Company, Reynolds Electric Company, Bryant Electric Company, Erner Electric Company, Lung Motor Company, P. R. Manufacturing Company, Dorgan Electric Manufacturing Company, Chicago Fuse Manufacturing Company, Trumbull Electric Manufacturing Company, A. W. Marshall Company and Giering Electric Sales Company, National Metal Molding Company, J. W. McNair Electric Company, Trumbull-Vanderpoel Electric Company, National X-Ray Reflector Company, Appleton Electric Company, Cutler-Hammer Manufacturing Company, George Cutter Company, McGill Manufacturing Company, William R. Noe and Sons, Michigan Vacuum Cleaner Company, Crown Novelty Company, Union Electric Company, Allino Switch-box Company, Saylor Electric Manufacturing Company. Standard Electric Novelty Company, Auto City Metal Spinning Company, Findlay Electric Porcelain Company, Pennsylvania Glass Company, A. O. Schoonmaker Company, Colon Washer Company, Samson Electric Company, Harter Manufacturing Company, Pittsburgh Lamp, Brass & Glass Company, Edison Storage Battery Company, Eureka Vacuum Cleaner Company, Gas Fixture & Brass Company, Eastern Flexible Conduit Company.

Group at Convention of National Electrical Contractors' Association —Right Hand.

Annual British Report on Electrical Accidents.

In view of the prevailing safety movement, the annual report of G. Scott Ram, British Home Office electric inspector, covering the official investigation of electrical accidents in 1913 in Great Britain, is of peculiar interest. In his report, Ram estimates that the horsepower of electric motors on factory premises in the United Kingdom is well over a million. As usual, he tabulates first the accidents, non-electrical and electrical, occurring at generating and substations during the year.

Accidents in Electric Stations.

The non-electrical accidents numbered 439, seven of which were fatal. The largest proportion were due to falls 121, four proving fatal; 88 occurred at boilers and steam plant; 46 were struck by falling bodies; 39 happened at engines, pumps and generators, and 125 are classed as miscellaneous.

The electrical accidents were remarkably few in view of the large number of electrical stations now in operation. The number is not larger than five years ago—94, three proving fatal. Workers engaged in cleaning, repairing, etc., at "live" switchboards or other "live" conductors were injured in 46 cases, two fatally; 19 non-fatally at switchboards when engaged in ordinary routine work; seven non-fatally while adjusting brushes and cleaning commutators, and through flashing at commutators; six workers were injured while cleaning or otherwise handling switchboards supposed to be "dead" and 16 are classed as miscellaneous.

In regard to the largest class of electrical accidents, there were a number which were clearly of a preventable nature. Six occurred to men working on or near high-tension apparatus without taking proper precautions, and it is remarkable that none of them had fatal results. In a substation, two men were about to connect up a transformer in a chamber in which all conductors had been made dead. They took in a length of bare copper wire, and were connecting one end of this to the transformer, the other end being free curled round the doorway and made contact with a bare conductor at 10,000 volts in the adjoining room. In another case a man assumed that a conductor at extra high pressure was safe because it was heavily taped up with insulating tape, but the insulation broke down. Again, three experienced engineers were discussing proposed alterations in an extra high-tension chamber when one of them inadvertently touched the apparatus with his elbow. Another man was cleaning substation switchgear when he touched the incoming terminals which had been left "live" through want of supervision.

Two fatal accidents occurred at medium-pressure switchboards. in one case a new transformer had to be connected up in a large substation in place of one which had failed, and the engineer was making a test at the oil switch on the secondary (440 volts) to ascertain if the transformer was correctly connected. This oil switch was in a narrow chamber into which the man had to crawl below other oil switches and was not intended for use as a switchboard passage-way. In this confined space he made a short-circuit and was killed. Mr. Ram says that there was no necessity to make the test in the chamber at all; it could have been done in the transformer room in accordance with the instructions of the engineer in charge of the work. In the other fatal case the man was working on a live switchboard contrary to standing instructions and was connecting up a new cable. He was standing on grounded transformer case and touched a live conductor, 420 volts alternating. This man, after successful application of artificial respiration, asked to be allowed to get up and walk and he then again collapsed and died of heart failure. Among the non-fatal accidents a considerable number were cases of severe burns from short-circuits due to the use of ordinary engine-room spanners, pliers, etc., on "live" switchboards; insulated tools should have been provided.

Among the accidents due to working on high-tension switchboards supposed to be dead, all but one were to skilled men and were the result of forgetfulness or carelessness. In one case the charge engineer of the station had had one cell of a large switchboard made "dead" for examination and inadvertently opened the door of the adjoining cell, which was live and took hold of the 6,600-volt conductors. He was brought round by the Schafer method. In another case a man opened a wrong door because he had not troubled to turn on a light in a dark passageway. Again, a generator oil switch failed to act properly when the remote-control switch was operated; two engineers who went to examine it made a short-circuit forgetting that the generator was still running and excited.

The miscellaneous section includes a fatal accident to a man who received a 230-volt alternating shock from the flexible conductors of a hand lamp, while he was scaling a boiler; the insulation was practically worn out. In another case a boiler cleaner came in contact with the conductors of an improperly constructed connector used within the boiler for connecting a hand lamp.

Accidents in Factories.

Turning next to the figures of electrical accidents in factories, other than electrical stations, these show a large increase, from 283 for 1912 to 418 for 1913, with 17 fatalities as against 15. A large number were due to inadequate skilled supervision both as regards the initial selection and installation of the plant and as to its subsequent working and maintenance. Often there is nobody technically qualified to look after the plant, and even if the plant is good and well installed trouble arises and accidents occur owing to want of technical supervision. On this account the accidents from arcing of switches have risen from 23 in 1912 to 56 in 1913, nearly all of them being due to neglect of proper maintenance of the plant, switches or apparatus, by reason of lack of skilled attention. Other accidents occurred at motor-starting panels through the failure due to poor construction of the starting rheostat. This becomes burned at the contacts which through want of attention get into such a condition that the automatic release fails to operate on shutting down. The workman, not noticing this, switches on again at the main switch with all the starting resistance cut out, producing a flare up at the switch and getting his hand and perhaps his face burned. Switches having covers with slots for the handles to work through offer no protection under these circumstances, the flash coming through the slot. Mr. Ram gives the following figures:

Arcing of switches 56, of fuses 17.

Shocks or burns when replacing fuse wires, 35; one fatal.

Portable apparatus, connectors and flexible wires, 66; three fatal.

Unprotected conductors, switches, terminals, fuses, etc., 42; five fatal.

Working on or near live conductors, 42 skilled and 43 unskilled—five of these were fatal.

Miscellaneous in manufacturing and repair work 66; one fatal.

Adjusting brushes and cleaning commutators, 10.

Miscellaneous 41, including two fatal.

The majority of the accidents to portable apparatus occurred in the handling of the connectors (27) and the flexible conductors (26), and the injuries were usually short-circuit burns. Mr. Ram says that in the case of the connectors, they would be avoided by the use of connector plugs of the hand-shield type or other safety types, or connectors protected by a switch so arranged that the plug can

only be put in or out whilst the switch is in the "off" position. The accidents from short-circuits in the flexible conductors were due to the use of worn out and dilapidated wire or to the fact that the protecting covering in the first instance has not been adequate as to thickness or material. Considerable trouble is often experienced with the flexible conductors for electric irons, short-circuits occurring at the point where they are led away from the iron, due to constant bending of the wire and insulation and to the heat from the iron.

Among the matters discussed by Mr. Ram is a low-voltage accident in which a man was severely injured by shock and burns by contact with a terminal block of an electric furnace working at 60 volts alternating. Apparently he was unable to release himself.

"Of the accidents to skilled persons, described as 'electricians,' when working on live conductors, 18 were due to short-circuits in the use of ordinary uninsulated spanners or pliers on live switchboards," says Mr. Ram in his report. "Three accidents—one fatal—occurred to men when trimming arc lamps. In the fatal case several lamps were connected across one phase of a 440-volt three-phase system through an autotransformer protected by a double-pole switch. In each lamp circuit was a single-pole switch. One of the lamps was burning badly and required adjustment. As the double-pole switch could not be used without putting out all the lamps the electrician switched off the one lamp only at its single-pole switch, which, of course, did not cut off the pressure. It was stated that he was in the habit of standing on a piece of board when handling the arc lamps, but on this occasion he omitted to do so and was killed. One of the other cases was similar, the man was rendered unconscious, but recovered. The second fatality was not satisfactorily explained. The man was attending to a motor (500 volts direct current) and had previously switched off at a double-pole switch. Someone, whether unthinkingly or by way of a joke, appears to have turned the switch on and off again, with a fatal result. The third fatality happened to an electrician when engaged in cleaning insulators of crane trolley wires. He was on a ladder when he received a shock and fell to the ground, fracturing his skull. Most of the accidents in this class need not have occurred, the persons concerned being acquainted with the dangers having often only themselves to blame for not taking proper precautions. The corresponding accidents to unskilled persons differ in this respect. The victims, having little or no knowledge of the dangers, are put to work or are permitted to work under dangerous conditions without proper precautions or supervision by competent persons in authority over them. In most cases there could have been no necessity for the work to be undertaken whilst the conductors were "live." Thirteen of the accidents, including the two fatal cases, were due to such persons being allowed to work close to dangerous live conductors, e.g., crane trolley wires, outdoor transmission wires, normally out of reach, but the work (e.g., painting, whitewashing, building) requiring them to get close to the conductors.

"In one of the fatal cases, a power company's, transmission lines (10,000 volts) passed over the factory grounds to a substation. A new building was being erected immediately under the wires, and the building work was proceeded with until the wall and scaffold platform were within four or five feet of the conductors. A joiner was then instructed to put up a fence on the platform to prevent the bricklayers from getting near the wires. In putting up the fence he touched one of the wires with his head and was killed. In the second case, power wires (440 volts) crossed some pipes about 14 feet from the ground and three feet above them. A joint on a pipe just below the wires required repairing, and a plumber who was employed to do the work came into contact with the wires and was killed. In another case a laborer was employed to clean the motors, etc., on Saturday afternoons when the works were shut down. The cleaning was effected by means of an ordinary flue brush with metal wire handle. He also had to sweep the floor of the operating side of the substation. There was a screen of expanded metal, 6 feet 6 inches high, protecting all the live apparatus. Having finished his work, he turned his attention to the extra high-tension gear within the screen, and appears to have stood on a box and reached with his brush over the screen to dust the high-tensions fuses of the potential transformer. Although he caused a short-circuit and received a severe shock and burns to his fingers, he was not seriously injured.

"The number of accidents in electrical manufacturing works has more than doubled. This is no doubt generally an indication of increased activity in manufacturing leading to pressure of work in the testing departments of the works concerned. The average age of 63 out of the 66 persons injured is only just over 20 years. This is due to the fact which I have pointed out before, that the testing operations are conducted very largely by apprentices or pupils. This arrangement suits the employers, the pupils having generally had a technical college training, and it is of great service to the pupils in giving them practical experience. Many of the accidents would probably be avoided if there were better supervision of the work by an experienced person.

"The fatal accident occurred in the testing department of a cable works, and was primarily due to a mistake in switching. A cable had been subjected to a high-pressure test, and the high-tension leads from the test cabin had not been disconnected from the cable at the conclusion of the test. A man went to the cable to do this later on when another cable was about to be tested. Unfortunately the pressure was again applied to the first cable by mistake and the man handling it was killed. The victim of the accident was also at fault in not having observed the rule of the works as to earthing the test leads before handling them."

In later sections of his report Mr. Ram recited a number of typical cases to show the irregularities that were occurring in complying with the official regulations, but he says that notwithstanding these bad examples more attention is being paid generally to the requirements as to safety.

"Competition and consequent cutting of prices is often responsible for work not being in accordance with the requirements. Thus, the occupier of a factory may order a switchboard from a contractor and may even specify that it is to be in accordance with the requirements of the regulations, but gives no information as to the conditions under which it is to be used. The contractor asks no questions and supplies an open-type switchboard. Such a switchboard is required to have certain space in front and behind and to be in a place set apart for the purpose. The board is, however, destined to be put up in a part of the works quite unsuited for the purpose, where there is insufficient space and where it cannot be fenced off. The purchaser is naturally annoyed when he finds out that it does not comply with the requirements and the contractor disclaims responsibility as he was not informed as to where it was intended to be placed. Several similar cases were found in regard to high-tension switchboards in public supply stations. In one the engineer had ordered a switchboard merely specifying that it must provide for the control of so many generators and so many feeders and to be in accordance with the requirements of the regulations, which, however, he had not tak-

en the trouble to study for himself. He obtained from the contractors a switchboard having no protection whatever for the live conductors in the back passageway, but merely a gate at the end of the passage. The contractor maintains that the switchboard is in accordance with the regulations, and so it would be if it were not necessary for anyone to enter the passageway while the conductors are live. Such a condition is, however, impossible in a station which cannot be shut down and the engineer finds himself with a switchboard which does not comply with the requirements."

Improvements by Utah Power & Light Company.

The Utah Power & Light Company expects the early completion of the work of rebuilding its transmission line running from Park City through the Wasatch Mountains into the Salt Lake Valley via the company's power plants on Mill Creek Canyon, southeast of Salt Lake. The transmission line extends from Park City to Eureka, Utah, and a large force of men are at work changing the cross-arm construction on the poles and restringing the wires. It is one of the most important improvements in service undertaken by the Utah Power & Light Company throughout the portion of its territory served by this line.

Every power plant in Utah owned by the company is being utilized to furnish power for the company's transmission and distribution lines.

With the completion of the big power houses on Bear River some of the smaller Utah plants have been relieved of a portion of the work they have been doing and the greater part of the load on the company's lines is assumed by the new power houses. This resulted only in a curtailment of the hours of operation of some of the smaller plants in Utah. None of the latter power houses, the officials say, have been shut down as previously reported, nor is this likely to occur at any time in the immediate future.

On the contrary, word from the general offices of the Utah Power & Light Company indicates that with a future development of the market for electric service throughout this section corresponding in any degree with the development of the market during the past eighteen months it will be necessary to operate every power plant to capacity within a very short time. The improvements and extensions to these power plants during the past year have amounted to hundreds of thousands of dollars and in addition to the regular work they are now doing, they form a power-generating reserve for the Utah Power & Light Company.

LETTER TO THE EDITOR.

Municipal and Private Ownership.

To the Editor:

I note in the issue of the *Electrical Review and Western Electrician* of May 30, 1914, an article on page 1089, written by F. O. March, published in *Financial World*, entitled "Efficiency Under Municipal and Private Ownership."

The purpose of the article is to show that the gross revenue per kilowatt-hour from municipally owned plants is less than that of the privately owned utilities, and that the operating expense is more for municipally owned plants than privately owned plants. This information is compiled from data given out by the Government and is the average of municipally owned plants as compared with the average of privately owned plants. The article attempts to establish the claim that the reason for this difference is that the privately owned utilities are so much more efficiently operated than the municipal plants.

I enter protest against the basis of comparison, which I claim is not accurate and is misleading, in that the writer attempted to compare the 1,562 municipal establishments (all of which are in towns not exceeding 50,000 to 60,000 population, with the exception of Seattle and possibly one or two other cities) with the 3,659 private utilities.

The output of the large commercial central stations for power purposes would naturally bring down the average rate for electrical energy, and of course would bring down the average cost of production and distribution. If the writer would pick out municipal plants operating in towns of 10,000 20,000, 30,000 and 50,000 population and compare them with privately owned utilities operated in the same-sized cities, this would be a fair comparison.

Among the 1,562 municipal plants there are a great many in extremely small villages, where it was necessary for the municipality to take up the matter of electric generation and distribution of electrical energy because there was not sufficient profit in it to tempt a private company at the time. These necessarily charge a higher rate than cities of 20,000, 30,000 or 40,000 population. The load-factor, as a matter of course, is very low in these small towns, and when the large cities of the country are combined with all other small electric utilities for comparison the average costs and receipts are naturally lower.

Misstatements of the character referred to here are the cause of directing the attention of a great many engineers and students of political economy to a thorough investigation of matters of this kind; and when the truth is revealed protests are made against such raw statements here under consideration. It is an insult to the readers of periodicals and magazines publishing misleading articles of this kind. It is not the proper way to combat municipal ownership.

If municipal ownership has any virtues or principles that are worth consideration they ought to be brought out. If municipal ownership is a detriment to the country at large the real reasons ought to be brought out, the good and bad sifted down in an unbiased way so that the public may be put in possession of the real facts. I must confess that the attitude of a great many writers on municipal ownership and rate regulation is driving public sentiment straight ahead for municipal ownership of everything in the utility line, simply because they will not give the real facts.

There are several municipal plants in this country that are doing very well, and making a good success under proper and careful management. It seems that these managers are singled out for attack simply because they are doing for the municipality what they would do for a private utility if they were in the employ of a private utility. Take the cities of Seattle, Wash.; Holyoke, Mass.; Jacksonville, Fla.; Tacoma, Wash.; Riverside, Cal.; and other municipally operated plants in this country; their rates are very favorable, and the cost of production will compare with any of the privately owned utilities in cities of the same population.

People forget that the water wheel, generators, boilers, engines and men can perform for a municipality the exact and same service that they can perform for a private utility, providing of course they are not interfered with by politicians. And is it not a fact that the history of the operation of utilities in the United States shows that politicians have interfered more with privately owned utilities than they have with municipally owned utilities? Is it not a fact that more men have been jailed from attempting bribery in the matter of privately owned utilities than has ever been connected with the operation of municipally owned utilities?

My plea is for the truth in all of these matters in order that we may arrive at the real facts.

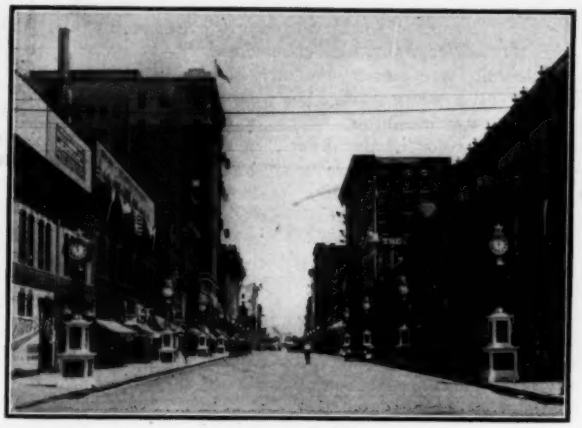
C. W. KOINER.

Pasadena, Cal., June 13, 1914.

Electrical Supply Jobbers to Meet.

The next meeting of the Electrical Supply Jobbers' Association of America will be held at the Clifton Hotel, Niagara Falls, Can., September 9, 10 and 11.

Fifteenth Street, Denver, Decorated for Elks' Jubilee.



Decorations on Champa Street, Showing Giant Elk in Distance.

Electrical Illumination and Decoration at Elks' Golden Jubilee.

The golden jubilee celebration marking the fiftieth anniversary of the founding of the order of Elks, was held during the week beginning July 13 at Denver, Colo. Over 30,000 members of the order and their friends were in attendance and everything connected with the gathering was declared to have made it the most successful convention ever held by this organization.

A prominent feature of the jubilee was the special decoration and electrical illumination of many parts of the city. This was probably the most lavish and artistic ever seen in Denver. William J. Barker, general manager of the Denver Gas & Electric Light Company, was chairman of the committee that had this matter in charge. Preparations for the illumination and decoration began more than a year ago. George E. Williamson, illuminating engineer of the company, was sent to many places throughout the country to secure ideas on spectacular displays of this nature; as the result of his studies, last week's jubilee witnessed a splendid variety of illumination designs in which the various symbols of the Elks order were naturally very conspicuous.

Every street in the business section of the city was lavishly decorated and illuminated and there were several special decorative pieces in different parts of the city. Conspicuous among these was the enormous elk that was built in the form of an arch straddling Champa Street near Eighteenth Street. This huge reproduction measured 47 feet from tip of nose to tail; its antlers extended to 60 feet above the street. This emblem was illuminated by means of a powerful searchlight placed on top of the Foster Building, two blocks away. The effect was very striking, as can be seen in the distant background of one of the accompanying illustrations.

Night View in Champa Street Adjoining Gas and Electric Building.

Another striking effect was the purple sunset arch at the Auditorium, Fourteenth and Champa Streets. This showed the setting of the sun in electric lights behind a characteristically beautiful Rocky Mountain scene displaying snow-capped mountains and a mountain stream. On each side of the word "Welcome" were depicted the dials of clocks with the hands at the eleventh hour, this being a characteristic Elks emblem. In this sunset arch 3,000 lamps in seven colors were used.

The four blocks on Champa Street between these two emblems were specially decorated and illuminated as a Court of Honor. On each side of the street at regular intervals were pillars with large glass panels showing a stream of water spraying over a red-tinted globe, thus giving a prismatic fountain effect. The

Electrical Illumination of Fifteenth Street.

Purple Sunset Arch.

elk's head was prominent at the base of each pillar and crowning each column was a clock dial three feet in diameter, surmounted by a white star. One part of the pillar was in purple, which is the predominant color of the order. In the evening these pillars were very handsomely illuminated. The fountains showed a reflected variety of iridescent and shimmering tints.

The decorative illumination of Fifteenth Street consisted of streamers of stars, each with twenty sixteen-inch stars, stretched across the street, with the clock symbol of the order in the center of each streamer. These stars were illuminated at night, as also was the clock dial. On Seventeenth Street the display consisted entirely of streamers with colored lights, chiefly purple. Purple globes were substituted for one-half of the regular white globes on the arc lamps along the main business streets.

Besides the special illumination of the streets, there were many displays on public and private buildings. The letters "B. P. O. E.," models of the elk's head, clocks with the hands set at 11, stars and other designs were used on the building fronts and some of these were illuminated with a flashing effect. The Elks Home at Fourteenth and California Streets naturally received special attention. An electrically illuminated arch was strung across the street at this point.

The ceremony of turning on the illumination was held on the evening of July 11. The governor of Colorado, the mayor of Denver, the head of the Elks order and other officials gathered on the balcony of the Denver Post Building, and at eight o'clock a large button was pressed, which turned on the entire lighting display. Messrs. Barker and Williamson, of the Denver Gas & Electric Light Company, were given much praise for the successful carrying out of the illumination and decoration.

New Cable to Panama.

To provide for the large increase in business which it is expected will follow the opening of the Panama Canal, a $1,500,000 cable will be laid from New York to Colon, by way of Guantanamo, before the end of the year. Later it may be extended to Brazil. The cable, which is being constructed in England for the Central & South American Telegraph Company, will be much larger than the present cable. The cable steamship *Colonia* on November 1 will leave England with the cable, for New York. It will begin laying it off Coney Island, proceeding southward at the rate of seven knots an hour.

Platinum Discovered in Germany.

Extensive workable deposits of platinum are said to have been discovered in Germany. They are located at Wendon, in the mining district of Westpnalia.

Seasoning of Wood by Electrical Means.

Reference has already been made in our issue of September 13, 1913, to the process of A. Nodon for aging wood by electricity. The method has been modified and simplified to such a degree that it is now commercially practicable. Tests which have been carried out show that there is a triple effect; chemical, physical and aseptic. The resinous materials in the sap are oxidized. There is a transformation of the cellulose which modifies the mechanical properties, and the action of germs is inhibited.

The material to be treated is placed between two electrodes consisting of flexible metallic cloth, which is saturated with water. This cloth consists of a sheet of galvanized iron between two sheets of jute. A number of layers of material may be used, an electrode being inserted between each two layers. These are connected alternately to conductors at each side and the internal resistance is thus reduced to as low a value as possible. The resistance will vary with the humidity of the wood and the amount of oil which it contains. The electromotive force is adjusted so as to send a current through the pile amounting to about five amperes for each cubic meter of material to be treated. Alternating current may also be employed, although electrolysis will affect the electrodes, requiring frequent reversal of the current. Regulation is less wasteful with alternating current, since induction regulators may be used in place of resistance.

It is said that the process may be carried on at the point where the timber is cut, and this can be done in the summer time, which is the best season for outdoor work. The time consumed in the operation is from one to two days, according to the condition of the lumber. If the process is carried on too rapidly, the wood may be cracked. About 150 ampere-hours per cubic meter of wood is required and the process need not be continuous. The cost of installation is restricted to the carpet electrodes which are used, while the cost of operation, of course, depends upon the amount of energy consumed. The electrodes cost about 75 cents per square meter. The average life is 12 months, the depreciation amounting to about two cents per day per cubic meter of wood treated by this process.

Tests carried out by the French Government give very satisfactory results. The results with wooden paving blocks were much better after treatment and it is also desirable for material for carpentry, joinery and general construction work.

Telegraph and telephone poles and railway ties have also been treated by this method.

New Powerful Wireless Station in Wales.

What is stated to be the largest transmitting station in the world has recently been completed at Cefndu, near Carnarvon, Wales, and will be formally opened within a few weeks. When the station is opened direct wireless communication will be established between the United Kingdom and the United States. Hitherto a marconigram handed in at London had first to be sent by land line to Clifden on the west coast of Ireland; thence it was transmitted to Glace Bay, Newfoundland, whence it was sent to the United States by land line. The new station will communicate direct with the station in New Jersey, just outside of New York, and the result will be practically to bring London and New York into direct wireless touch. By this means it is hoped to shorten the time occupied in communicating with the United States, as well as to reduce the cost of transmission.

At the Cefndu station there are 10 steel masts, each 400 feet high, and the last row of masts is about 1,400 feet above sea level. The plant at this station will be controlled and operated from the receiving station at Towyn, Merionethshire.

Convicted for Theft of Electricity.

Convicted in the Criminal Court in Louisville, Ky., of the charge that he tapped a supply wire before it reached the meter and "converted electricity to his own use," Charles Wilson, a negro grocer in Louisville, Ky., awaits sentence under the law which provides for fines of from $50 to $500 or from three to twelve months in jail, or both. Testimony of the representatives of the Louisville Gas & Electric Company was heard by the jury. The defendant pleaded that he did not know anything about the alleged "jump-over" through which the store got its current for lighting.

Merchants Urged to Light Stores Brightly In Dull Season.

The Canton Electric Company, Canton, O., has been trying the effect of advertising for the purpose of counteracting the regular summer tendency on the part of merchants to cut down expense during the dull season by eliminating a part of their electric lighting. The fact that a poorly lighted store looks dead and unattractive is pointed out as a reason why during the dull season it is better to assist business by better lighting rather than to discourage it by the opposite policy, at an insignificant saving in energy consumption.

New Electrical and Mechanical Appliances

Ornamental Street Lighting by Pillar Flame-Carbon Arc Lamps.

A new ornamental arc lamp of the flame-carbon type has recently made its appearance and it seems to have a number of features which will make it popular with central stations for ornamental street lighting and with the owners of amusement houses, public halls, and similar places for advertising purposes.

An important feature of this new lamp is its adaptability to practically all of the standard commercial circuits, lamps being available for operation on 60-cycle, alternating-current 10, 7.5 and 6.6-ampere series circuits and 110-volt multiple circuits and on 110-volt direct-current multiple circuits. The multiple type is generally used where a few lamps are desired for advertising purposes, such as in front of motion-picture theaters, public halls, etc. The intense light from the flame-carbon arc lamp, combined with the ornamental features of either a standard or a bracket of tasteful design, makes this an illuminating unit having great advertising value.

Pillar Flame-Carbon Arc Lamps, Showing (1) Outer Globe Raised and (2) Mechanism after Cap and Globes are Removed.

Either white or yellow light can be produced, depending upon the carbons used. The standard glassware consists of an Alba outer globe and a clear inner globe. Various effects can be produced by using various combinations of inner and outer globes and either white or yellow-light carbons.

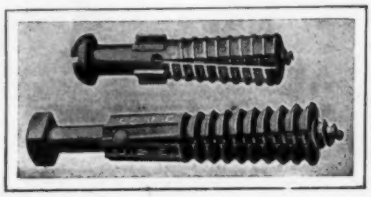
The globe is so made that, while the most of the light is thrown downward where it is needed, enough light is thrown upward to illuminate the fronts of buildings to a considerable height.

The mechanism is in an upright position above the globe and is held firmly by three small upright rods. Because of the diffusing glassware used, these rods do not throw any shadow on the surrounding buildings or street. The outer globe can be readily raised and locked in a position to facilitate trimming the lamp and cleaning the globes.

This lamp, known as the "type O pillar flame-carbon arc lamp" is made by the Westinghouse Electric & Manufacturing Company, the mechanism used in it being the same as that used in the Westinghouse type H flame-carbon arc lamps. It is adaptable for use on a large number of ornamental standards and brackets now made by various manufacturers. While commonly mounted at a height of 14.5 feet above the pavement, a somewhat better light distribution, and which is more free from glare, is obtained by mounting it at a height of 18 feet.

A New Line of Screw Anchors and Expansion Shields.

The U. S. Expansion Bolt Company, 48 Dey Street, New York City, is bringing out a new line of one-piece composition anchors and two-part malleable-iron shields, for use with wood screws from one-eighth inch to one and one-half inches in diameter. They are of simple construction, quick and easy of application and long and strong on holding power. The company is rapidly extending its operations and expects shortly to open branch offices in all of the more important distributing points.



Improved Screw Anchor and Lag Expansion Shield.

New Porcelain Receptacle for Mogul-Base Lamps.

The present tendency in illuminating engineering is to replace clusters of small-candlepower incandescents, and other lighting units with a single large-base lamp of high candlepower.

To meet these particular conditions the Bryant Electric Company, Bridgeport, Conn., has designed a new porcelain receptacle of the mogul type, which is suitable for lamps of the highest candlepower that have yet been developed.

This receptacle is approved by the Underwriters Laboratories at a rating of 1,500 watts, 250 volts, and provides for the mogul-base lamp a receptacle of the same type and design that experience has proven to be extremely useful for medium-base lamps.

Receptacle for 1,500-Watt Mogul-Base Lamps.

It may be used with many types of indirect and semi-indirect fixtures, as well as for exposed wiring. All live parts on the back of the receptacle are sealed in with a permanently hard compound which will not be affected by any heat to which it can be subjected in service.

New Type of Automatic Telephone Exchange.

A new automatic telephone exchange has been installed at Darlington, England. It has a capacity of 800 lines initially and 2,800 lines ultimately. The equipment was manufactured and installed by the Western Electric Company, Limited, of London, England, and is the first full automatic exchange of that company's system to be brought into public service.

The new installation at Darlington is described in detail in a sixty-page article by J. Hedley, in July issue of *Post Office Electrical Engineers' Journal.*

Automatic Sprinklers to be Installed in Patent Office.

A contract was recently signed by the Interior Department officials for the construction of an automatic water-sprinkler system at points in the Patent Office at Washington, D. C., where valuable records are stored in wooden file cases.

For some years efforts have been made to have Congress appropriate for a building for the Patent Office, where the records could be given good protection from fire. However, Congress has ignored the request, although officials of the Patent Office pointed out that the destruction of the office records would mean the beginning of endless litigation, because the only proofs of patent cases are contained in these files.

It is believed that the introduction of the sprinkler system will greatly decrease the danger of serious destruction from fire, although efforts will still be put forth to obtain an appropriation for another building. The sprinkler was deemed more efficient than the chemical system, which some time ago the department proposed to establish. At that time plans were drawn for the installation of two large chemical tanks in different parts of the building, with hose lines leading to the files. This, however, was given up for the automatic water system.

New Interurban Electrification in Utah.

The Ogden Rapid Transit Company has awarded the contract for the line material and electrical equipment necessary for the electrification of the extension of its interurban line north from Bingham City, Utah, to Preston, Idaho. The electrical equipment of the substations and cars was awarded to the Westinghouse Electric & Manufacturing Company; 1,500-volt direct-current equipment will be used. The contract for the line material was awarded to the Ohio Brass Company.

This 96-mile extension north from Ogden to Preston, will connect at Ogden with the Salt Lake & Ogden Railway Company, better known as the Bamberger line, which has been operating by electricity between Salt Lake City and Ogden, a distance of 36 miles, during the past three years. At Salt Lake City the Salt Lake & Ogden Railroad connects through a union depot with the Orem line running 50 miles south from Salt Lake City to Provo.

The Orem line is at present being equipped with Westinghouse electrical equipment, using 1,500-volt direct-current also. The Orem line will next year extend its terminus from Provo south to Payson, a distance of 20 miles farther, so that when this system is completed and in operation the state of Utah will be traversed from north to south, a distance of over 200 miles, with high-speed interurban electric lines.

A Japanese Government submarine telegraph cable will be laid between Nagasaki, Japan, and Shanghai, China.

A New Electric Grinder.

The new electric grinder recently developed by the Wisconsin Electric Company, of Racine, Wis., embodies several unique features which would seem to insure for it a widespread application particularly among machine shops, tool rooms and garages. One of the preeminent features of this machine is its lightness, the total weight of grinder and attachments being only 16 pounds. It is therefore readily handled and has been found particularly suited for operations such as grinding milling cutters, tapered reamers, lathe centers, dies and tools of various kinds, and for various repair operations.

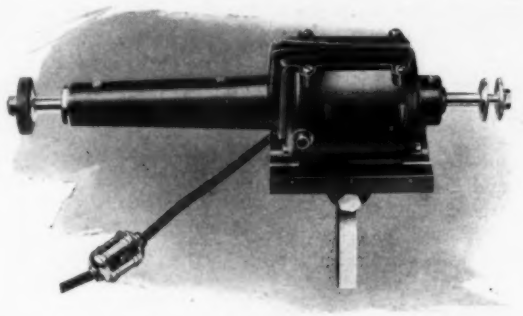


Fig. 1.—Dumore High-Speed Electric Grinder Manufactured by Wisconsin Electric Company.

The Dumore grinder, as it is called, was designed by Chester H. Beach, electrical and mechanical engineer of the Wisconsin Electric Company, who has had wide experience in designing such apparatus and he claims that in the Dumore grinder the highest degree of efficiency and accuracy has been reached.

The armatures of these machines are dynamically balanced, thus assuring accuracy at all speeds and doing away with chatter and flutter, also elim-

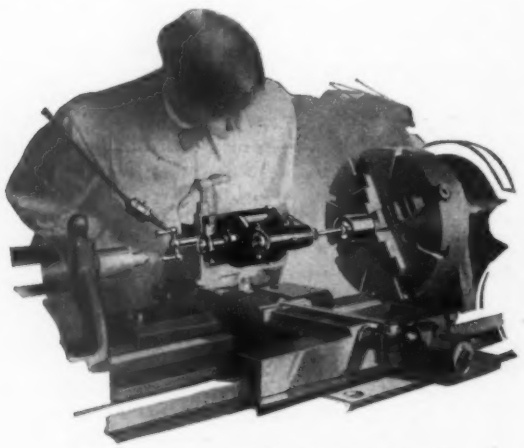


Fig. 2.—Dumore Grinder Applied to Lathe.

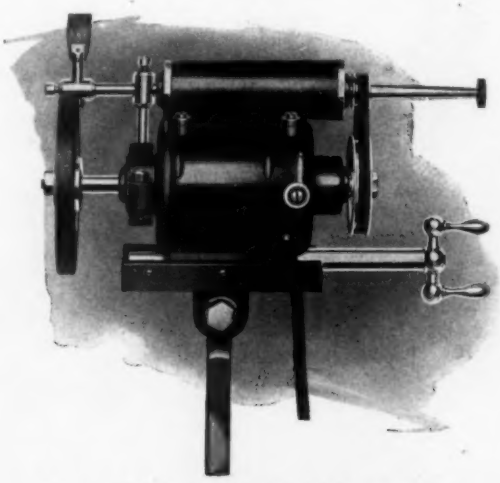


Fig. 3.—Dumore Grinder Mounted on Tool Rest.

inating what is known as critical speed. Two other important points are its extreme simplicity and rigidity. Accuracy has been provided for by the use of imported ball bearings throughout.

The motor casings and internal housings are die mold castings which are machined to absolute accuracy and the main shaft or spindle and also the spindle of the internal attachment are ground to within 0.00025 inch and also balanced.

The motor is 0.25 horsepower in size, of the universal type manufactured by the Wisconsin company. It drives a 4.5-inch wheel at 10,000 revolutions per minute and drives the internal attachment at a speed of 35,000 revolutions per minute. These high speeds assure the operation of a great surface speed on the wheels, which is a very important point in exact grinding.

The accompanying illustrations show the Dumore grinder, two of its applications and several views of the factory of the Wisconsin Electric Company, a plant admirably equipped to produce work of a high grade such as necessitated in the manufacture of the Dumore grinder and Dumore vacuum cleaner.

Fig. 1 is a view of the grinder which conveys a clear idea of its portability and compactness. Figs. 2 and 3 show two applications of the new machine.

Fig. 4 shows a corner in the motor testing and inspection department. In this room all motors are thoroughly tested and run continuously for several hours, particular attention being paid to heating and oiling. Rigid inspection of bearings is also a very important feature.

Fig. 5 is a sectional view of the machine shop showing a few of the turret lathes, multiple spindles, etc. All work in this factory is jigged and parts standardized. Machinery of latest design, so as to increase production and improve quality, is used throughout.

Fig. 6 is a section of the tool and die department. The Wisconsin Electric Company makes all of the tools and dies that enter into the manufacture of its specialties. The most particular work turned out in this department is the armature and field dies and punchings.

Fig. 7 is a close view of the assembling operations on the portable electric tool-post grinders. Ball bearings and armature must be carefully adjusted so as to insure the most extreme accuracy throughout the operation of this tool.

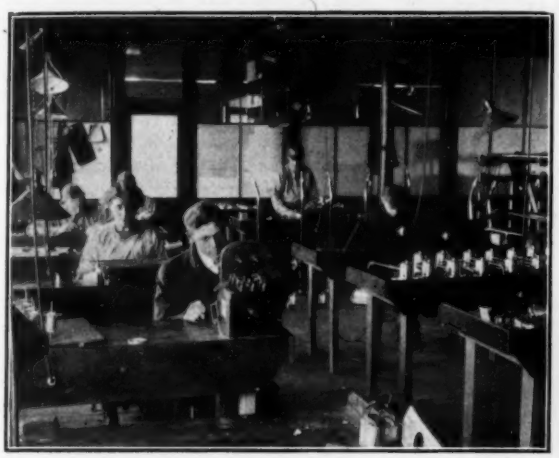


Fig. 4.—Corner of Motor Testing and Inspection Department, Wisconsin Electric Company.

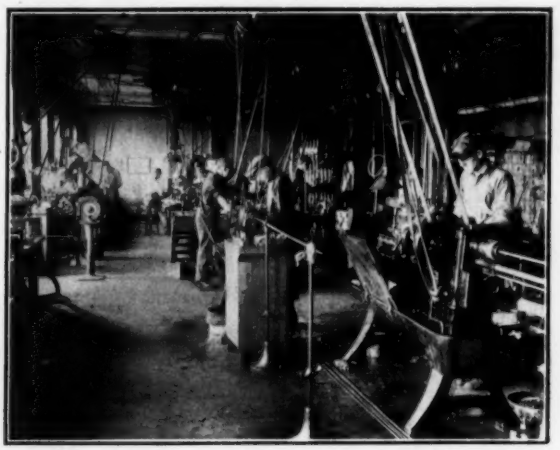


Fig. 5.—Sectional View of Machine Shop, Showing Lathes, Spindles, Etc.

Fig. 6.—Tool and Die Department of the Wisconsin Electric Company.

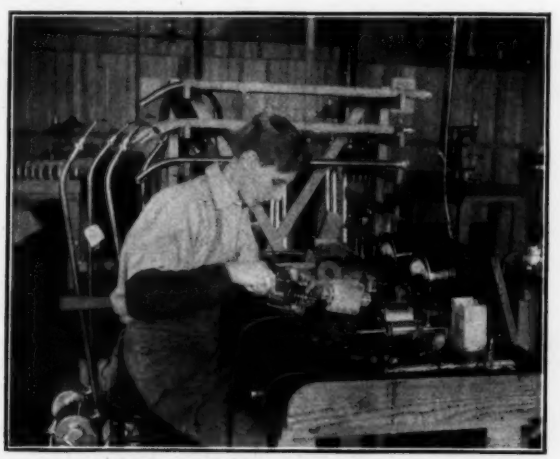


Fig. 7.—Assembling Operations on the Dumore Tool-Post Grinder.

Handsome Electric Fixtures for Utah State Capitol.

The contract for the lighting fixtures for the new State Capitol Building at Salt Lake City, Utah, was awarded by the Capital Commission to the Mitchell-Vance Company, of New York City. The cost of the fixtures will be $25,000. The principal fixture is an immense electrolier 13 feet in diameter containing 240 lights.

A Panelboard Designed for Safety and Compactness.

A new type of panelboard with many unique features and advantages has just been placed on the market. Several years have been devoted to its development. One of the main features embodied in the design is in line with the now popular safety movement. The means for attaining this has been by removing the busbars from the front of the board and imbedding them within the base. By this construction there has been achieved at the same time a very decided reduction in the size of the board. This latter advantage has again resulted in decreased weight and cost. Other advantages of the new design will be pointed out after the board has been described.

A general idea of the appearance of this new type of panelboard is obtained from Fig. 1, which is a ten-circuit, three to two-wire board with fuse receptacles of standard Edison plug type. The receptacles for each branch circuit form a distinct unit, which can be readily removed from the board by taking out the two contact screws at the center of each receptacle. The main-circuit terminals are on the bottom of the board and from this point on the busbars are entirely concealed. The manner in which this is done is made clear from Fig. 2, which is a rear view of the board with part of the sub-base removed to show the interior construction. Both the base and the sub-base are of a molded insulating material which is tough and not easily breakable and at the same time light in weight. In the under side of the base, channels are grooved in which the busbars are imbedded. Between the branches from the middle, or neutral, bar and the outer bars are insulating plates. The sub-base, shown in black in Fig. 2, covers the bars completely on the back of the board so that the board can be mounted directly against a steel cabinet or other metallic structure since no live contacts are exposed. The connection of the two receptacles constituting each branch-circuit unit to the busbars is obtained through the screw in the center of each fuse receptacle and this, as already alluded to above, serves also to hold the receptacle firmly in place. A square recess is formed in the bottom of the receptacle unit for a number plate. The numbers which serve to designate the different circuits are made with black figures on a white celluloid plate. The number plates can be turned in any direction so that the board may be mounted vertically or horizontally, if desired. The insulating material constituting the base and sub-base is of polished black finish. The fuse receptacles are of hard porcelain finished in black glaze. The busbars are made of hard-drawn copper.

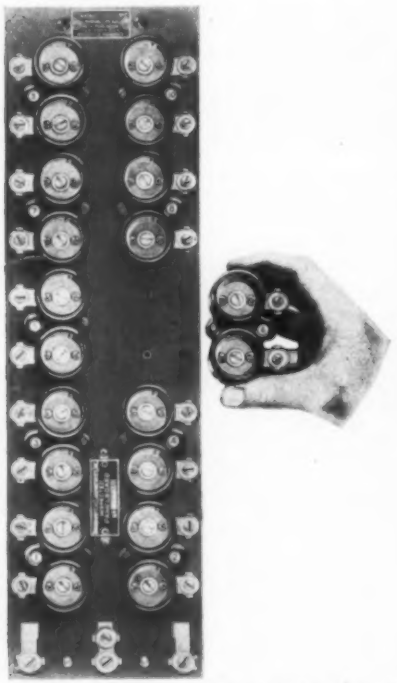


Fig. 1.—Starrett Panelboard, Showing One Branch-Circuit Unit Removed.

Fig. 2.—Rear View, Showing Method of Imbedding the Busbars.

It will be observed from the foregoing description that the board not only has its busbars entirely imbedded, but has a minimum amount of exposed metal parts; thus the replacing of a fuse is made with the utmost safety. Since the two outer busbars lie directly beneath the rows of fuse receptacles, a marked compactness of construction is attained; the width of the board shown in the illustrations is only 5.125 inches, and its length is only 17.625 inches; the depth is two inches over all. The weight of this board is only seven pounds. This compactness has a number of important advantages, among which are that the board can be installed in many places where a board of ordinary construction could not be used; shipment of the boards can be made at a minimum cost. Since the board is all assembled at the factory, the installation on the premises is made with great convenience and saving of time and labor. The customary practice of assembling cutouts at the premises is thereby entirely dispensed with. If for any reason one of the branch-circuit fuse receptacles is to be removed it can be readily done without disturbing any other circuit on the board. The compactness of the construction has still another advantage in that it permits the boards to be produced at a cost no higher than that of a panelboard made from ordinary porcelain cutout blocks. It also means a reduction in the cost of steel cabinets or other inclosures where these are used. The panelboards are shipped in cartons, which a jobber can readily stock on his shelves for prompt delivery. Heretofore it has been practically impossible for jobbers to keep panelboards in stock because of their bulky nature and the loss in breakage.

These panelboards have been approved by the Underwriters' Laboratories and each one of them bears the inspection label thereof. Their appearance is very neat. Although at the present time only the standard three to two-wire boards for 4, 6, 8 and 10 circuits have been placed on the market, other types are in process of manufacture. These panelboards have been developed and are being manufactured by the Starrett Electric Company, 213 West Superior Street, Chicago, Ill.

New Brown Resistance Thermometer.

The Brown Instrument Company, Philadelphia, Pa., has brought out a new resistance thermometer for measuring temperatures from 200 degrees below zero to 1,800 degrees above zero, Fahrenheit, with the greatest accuracy. This instrument is particularly well adapted for measuring low temperatures which cannot readily be measured with thermoelectric pyrometers, and is particularly useful for measuring the temperatures found in driers and ovens, in the bearings of machines which may overheat, in the

windings of motors and transformers, on refrigerating machines, and in rooms which must be maintained at a constant temperature.

The instrument consists of a bulb or coil of resistance wire, through which a current is passed, and which changes in resistance with change in temperature. Bulbs located at numerous points around the plant are connected by three-wire cable to the indicating instrument and switchboard, which can be placed at any desired point. In determining the temperature it is simply necessary to switch any bulb onto the indicating instrument. If a constant temperature is to be maintained, the pointer can be adjusted to this temperature and the deflection of the pointer on the upper scale of the instrument will show the increase or decrease in temperature. This new instrument operates on either dry cells or storage batteries, or 110 or 220-volt direct-current lighting circuits.

New Resistance-Type Thermometer.

Its chief advantages are in the ability to read moderate temperatures from one central station without the necessity of going about from one point to another to read the temperature as indicated on thermometers, and in the fact that the bulbs in this instrument are all of metal, and therefore not liable to be broken as is the case with a glass thermometer. The indications of the instrument are guaranteed to be within one per cent.

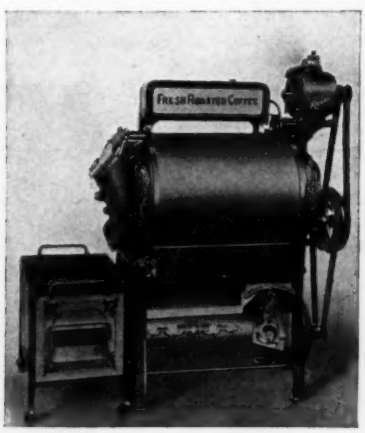
Electrically Driven Coffee and Peanut Roaster for the Retail Trade.

Every one handling coffee knows that freshly roasted coffee is much better than that which has been roasted for some time, and those retail dealers desirous of serving their customers with the best have always been anxious to secure means of roasting their own coffee. Heretofore, however, coffee-roasting machinery has been so bulky and expensive that only wholesalers and others handling coffee in large quantities were able to install it.

The Royal coffee roaster, made by the A. J. Deer Company, Hornell, N. Y., was developed to permit retailers to secure the advertising possibilities arising from supplying their trade with freshly roasted coffee.

This machine is small, compact, and so simple in operation that any clerk can use it. The coffee is placed in a cylinder which is surrounded by a jacket and revolved by a Westinghouse electric motor. Here it is subjected to the heat of a gas or gasoline flame and when roasted is dropped into a movable car where it is quickly cooled by means of an air blast.

The machine illustrated has a capacity of 25 pounds of coffee; its overall dimensions are: height, 4 feet 8 inches; length, 4 feet 8 inches, and width, 2 feet 4 inches. It will roast 100 pounds of coffee at a cost of 18 cents. This covers cost of the current for the motor and for the gas for the flame.



Coffee and Peanut Roaster.

The Royal roaster is also suitable for roasting peanuts.

Slate for Electrical Purposes.

There are probably over 100 active slate quarries in the United States, most of which are willing to take orders for "electrical" slate. However, there are probably not more than six quarries which are producing slate which will pass reasonable electrical tests.

The best slates for electrical purposes are quarried in Monson County, Maine, and in Rutland County, Vermont. The former is a clear black slate and the latter is a clear purple slate. Both have practically the same insulation value and mechanical characteristics. The Monson slate has the advantage of a natural black color, but it is much more expensive and more difficult to obtain that the Vermont purple. The latter can readily be finished with a permanent dull black lacquer to imitate very closely the Monson slate.

Certain grades of Pennsylvania clear black slate, when carefully selected, are entirely satisfactory and largely used for low-voltage work, instrument bases, box linings, etc.

These interesting observations on the sources and relative values of slate for electrical use have been gathered in the extensive experience of the Davis Slate & Manufacturing Company, 608 East Fortieth Street, Chicago, Ill., which firm makes a specialty of electrical slate.

Display Stands for Electric Heating Devices.

It is, oftentimes, a hard matter to display electric heating devices to their best advantage. Show cases and wall cabinets are usually too full and new ones frequently require the alteration of the entire display room.

Heating-Device Display Stand.

Very recently the General Electric Company arranged to supply at actual cost a display rack suitable for its many heating and cooking devices. The display rack is substantially made of metal, handsomely finished in imitation of cherry with gold bronze lettering. It occupies a compact space two feet by three feet and stands about six feet high. The shelves will amply accommodate a complete line of heating devices. This forms a very convenient method of displaying electric heating wares in an attractive manner and is a handsome addition to the show-room equipment.

Allen-Bradley Carbon-Compression Type Resistance Starters for Squirrel-Cage and Slip-Ring Motors.

The Allen-Bradley Type H resistance starters, which are made in sizes up to 100 horsepower, and provide for complete no-voltage and overload protection for induction motors, are the result of a careful study of the requirements of the apparatus for this service, while the design of the same has been benefited by the experience gained in the manufacture of previous alternating-current devices, each of which contained some, but not all of the desirable features incorporated in the present outfit.

The new starters embody the carbon compression resistance units, which during many years of service have demonstrated their superior efficiency over other forms of resistance. The wire-wound or grid-type resistor quite frequently causes considerable trouble and exasperating delays, due to the fact that it becomes corroded and eventually burns out, which is not possible with the carbon compression resistance. The latter also gives the motor a much more even and smooth start, as the resistance is not cut out spasmodically but is changed gradually with the increase of pressure applied to the resistance column. One of these units is supplied for each individual phase. The pressure applied to the tubes at any instant is the same, which is brought about by an equalizing mechanism, so that all of the phases are always entirely balanced.

The accompanying illustration, Fig. 1, gives an approximate idea of the operation and construction of these starters. It is not necessary to furnish a line switch with these starters, as in the off position the motor is completely disconnected from the line. As the operating lever is raised, contact is made between the resistance units and the line, which thus closes the circuit to the motor. Upon further raising the lever, the current value is finally reached at which the motor will turn over and it then comes up rapidly to full speed.

When the lever reaches the full running position, the operating mechanism is caught by a latch which holds the same, while the lever may be returned to the starting position. In order to stop the motor it is only necessary to release the latch, which is accomplished by pushing the lever a few inches in the opposite direction from the starting. In the starting position the running fuses are shunted out of the circuit and may, therefore, be of such capacity as to actually give the motor effective protection while in operation.

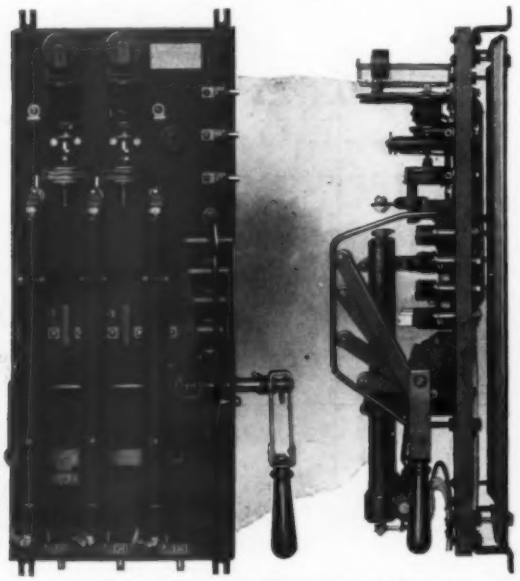


Fig. 1.—Front and Side Views of Starter.

Fig. 2.—Starter Inclosed in Steel Cabinet.

Instead of depending upon fuses to guard the motor against an overload, it is often desirable to have a somewhat more reliable protection, in which case two adjustable relays are provided. These overload relays are provided with time limits, which do not in any way impair their real protective value and yet prevent their operating on spasmodic changes in the motor current, due to fluctuations in the line voltage or other causes. This makes it possible to set the relays at a value which will protect the motor against a bona fide overload or running single phase without the annoyance of having them operate frequently and stop the motor, due to trivial disturbing factors. This overload relay has a marked advantage over fuses, because, if the relays operate, the motor is entirely disconnected from the line and it stops running, whereas if one fuse only is blown, the motor is likely to run single phase with much danger of being burnt out, provided, of course, that the starter is not equipped with the no-voltage release feature described in the following paragraph. Another item of importance is the fact that the expense of fuse renewal is saved as well as the time of replacing them.

To give the motor absolute and foolproof protection from running single phase, should only one fuse blow, or for any other reason one line become interrupted, and to give positive no-voltage protection in any and all phases, a no-current tripping device is provided. This consists of additional weighted levers pivoted over the latch, one to each phase, held by an electromagnet connected in series with the motor lines. These series magnets will hold up the levers on the no-load current and still not become overheated by any possible overload current which the motor may take. If one phase is interrupted, the electromagnet in that phase is completely de-energized, allowing the lever to drop and release the starter, which completely disconnects all phases and the motor is stopped.

This up to the present time, is an exclusive feature of the Allen-Bradley starting switch. It is very valuable as a large percentage of burnouts are caused by polyphase motors running single phase, due to some accident which interrupts the other phases.

These starters can be inclosed in a steel cabinet, as shown in Fig. 2, which makes a very neat installation, and which furthermore is always to be recommended as it puts a curb on meddling hands and also protects the equipment against dust accumulations. The new starters are made as light in weight as is compatible with the service they are expected to endure, thus making the same easy to install.

Latest Approved Fittings

CABINETS—Crouse - Hinds Company, Syracuse, N. Y.

"Condulet" cast-iron cabinets.

For inclosing switches and cutouts, 30, 60, 100 and 200 amperes, 250 volts, and 30 and 60 amperes, 600 volts, series: Y, YK, YKW and Z.

For inclosing fuses only. Complete with cutout bases, 200 amperes, 250 volts, series FB.

Approved June 15, 1914.

CABLES, Armored.—Penn Yan Cable Company, Penn Yan, N. Y.

Flexible armored cable, single wire or multiple conductors.

Marker: Uncolored twine running longitudinally between the armor and the conductor.

Armored cables shown by tests and examinations conducted by the Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters, and examined at factories and passed by the Underwriters' Laboratories, have labels attached.

Approved May 23, 1914.

CONDUIT BOXES.—Crouse-Hinds Company, Syracuse, N. Y.

"Condulets"—For use as outlet and junction boxes.

Types: A, B, BE, C, CO, D, CH, CHC, E, EX, JRM, JRR, KRM, KRR, LRB, LB, LF, LL, LR, LBB, LFB, LLB, LBL, LU, QPB, U, UB, T, TB, TL, TR, X, DF, LFM, TM, JRS, KRS, JRYM, KRY, KRYA, MOC, LBA, LBV, TJ, TJD, UGC and UGX.

Series: FD, FS, G, H, J, K, RJ, RK, N, P, PM, PH, PHM, QH, QK, R, S, SP, W, PR, PJ, RS, LO, CL,, BO, SO.

Composition, metal and porcelain covers for all of the above condulets.

For exposed work, all types and sizes are approved.

For concealed work, all types and sizes when installed with at least two supporting screws and with covers and attachments exposed and easily removable are approved.

Approved June 15, 1914.

CONDUIT OUTLET BUSHINGS, COUPLINGS AND FITTINGS.—Course-Hinds Company, Syracuse, N. Y.

"Condulet," service-entrance fittings.

Fuseless.

Types BE and Fe.

Types B and E, when installed with opening facing downward and with rubber gaskets between condulet and porcelain cover.

Fused.

For two, three and four-wire services, 30 to 400 amperes, 250 volts; and 30 to 60 amperes, 600 volts, type FF.

Only for use at service entrance.

Approved June 15, 1914.

ROSETTES, Fuseless.—Pass & Seymour, Incorporated, Solvay, N. Y.

Three-ampere, 250 volts.

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association.

Cleat type, catalog Nos. 76, 602-03, 607, 703, with porcelain sub-bases.

Concealed type, catalog Nos. 79, 601, 703.

Molding type, catalog Nos. 176, 610 Also catalog No. 39 for use with "National " metal molding.

Conduit box type, catalog Nos. 1174-75, for use on metal ceilings.

Ceiling button type, catalog Nos. 70. 170.

Approved June 15, 1914.

SWITCH BOXES.—Crouse-Hinds Company, Syracuse, N. Y.

Condulet switch boxes.

Type FH and series FD and FS, with metal and porcelain covers.

Approved June 15, 1914.

SWITCHES, Combination Cut-out.—Crouse-Hinds Company, Syracuse, N. Y.

Porcelain-base switches with cartridge-fuse cutouts, two and three wire, 30 and 60 amperes, 250 volts. Type YKK.

Approved June 15, 1914.

SWITCHES, Combination Cutout.—Hart & Hegeman Manufacturing Company, 342 Capitol Avenue, Hartford, Conn.

"H & H" combination cutout switches for car lighting, five amperes 600 volts, consisting of surface snap-switch mechanism and a single-pole cartridge-fuse extension mounted on a porcelain base and inclosed with a porcelain cover. Single-pole, catalog No. 2335 and two-circuit, catalog No. 2338.

Standard only for use on car-lighting circuits and with approved car-lighting fuses.

Approved June 12, 1914.

SWITCHES, Push Button Flush.—The Hart & Hegeman Manufacturing Company, 342 Capitol Avenue, Hartford, Conn.

Double-pole, 10 amperes, 250 volts, for panel-board use, catalog No. 3048.

Two-section electrolier, five amperes, 250 volts, 10 amperes, 125 volts, catalog No. 2968.

Three-section electrolier, five amperes, 250 volts, 10 amperes, 125 volts catalog No. 2967.

Also above types with lock attachment.

Remote-control switches, catalog No. 2061, six amperes, 250 volts, for solenoid-operated apparatus.

Approved June 12, 1914.

SWITCHES, Rotary Flush.—The Hart & Hegeman Manufacturing Company, 342 Capitol Avenue, Hartford, Conn.

Single-pole, three amperes, 250 volts, catalog Nos. 200, 300, 600.

Single-pole, five amperes, 250 volts, 10 amperes, 125 volts, catalog No. 2881.

Single-pole, 30 amperes, 250 volts, catalog Nos. 3061, 3108.

Double-pole, 10 amperes, 250 volts, catalog No. 2882.

Double-pole, 30 amperes, 250 volts, catalog Nos. 3004, 3107.

Three-way, three amperes, 250 volts, five amperes, 125 volts, catalog No. 2263.

Three-way, five amperes, 250 volts, 10 amperes, 125 volts, catalog Nos. 203, 303, 603.

Four-way, two amperes, 250 volts, five amperes, 125 volts, catalog Nos. 204, 304, 604.

Two-circuit, two amperes, 250 volts, five amperes, 125 volts, catalog Nos. 2681, 2886-88 inclusive.

Three-circuit two amperes, 250 volts, five amperes, 125 volts, catalog Nos. 2885, 2980, 3055.

Also above types with lock attachment.

Approved June 13, 1914.

SWITCHES, Surface Snap.—The Trumbull Electric Manufacturing Company, Plainville, Conn.

Porcelain cover.

Single-pole, 10 amperes, 125 volts, five amperes, 250 volts; catalog Nos. 425 and 427.

Double-pole, 10 amperes, 250 volts; catalog Nos. 455 and 457.

Three-way, 10 amperes, 125 volts, five amperes, 250 volts; catalog No. 468.

Four-way, five amperes, 125 volts, two amperes, 250 volts; catalog No. 478.

Also the above types with lock attachment (catalog No. 398) and key.

Approved June 12, 1914.

WIRES, Rubber-Covered.—B. F. Goodrich Company, (Diamond Division) Akron, O.

Marking: One red and one black thread parallel in braid with one red thread crossing; or in lead-incased conductors without braids: two red threads and one black thread parallel to the conductor.

Rubber-covered wires shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters, and examined at factories and passed by Underwriters' Laboratories, have labels attached.

Approved June 15, 1914.

Current Electrical News

NORTH ATLANTIC STATE.

HORNELL, N. Y.—The Hornell Electric Company will extend its lines to Canisteo, and will supply electricity for the lighting of the streets and also private use. Address L. T. Mason, superintendent.

SOUTH ATLANTIC STATES.

EASTON, MD.—$30,000 in bonds has been voted to install an electric light plant here. Address J. B. Clark, city clerk, in regard to the matter.

RICHMOND, VA.—A movement has begun among the business men and organizations to rebuild the plant of the Richmond Electric Works, burned recently with a loss of $75,000. Edward J. Willis, it is understood, will be a director. About $200,000 will be needed to put the plant back into operation.

BARBOURSVILLE, W. VA.—The City Council is planning to install a municipal electric light plant at a cost of $5,000. Address the city clerk for desired information.

REYNOLDS, GA.—The J. B. McCrary Company, of Atlanta, is preparing plans for the construction of a municipal electric-light plant here. Address G. L. Cooper, clerk, for desired information.

ROCKMART, GA.—An election will be held August 6 to decide the question of issuing $5,000 in bonds for enlarging the electric light plant here. It is planned to install a 24-hour service. Address R. R. Beardsley, mayor, in regard to this improvement.

NORTH CENTRAL STATES.

COLUMBUS, O.—Considerable new electrical equipment will be required by coal mines throughout the Hocking Valley, Portsmouth, Crooksville and Jackson districts of Ohio by change in the method of payment for mining. By a new state law which went into effect in May a mine-run scale supersedes the screen scale that has heretofore been in force. To meet this, mine-owners will put in electric picking tables, new weighing apparatus and make other additions to tipple facilities. This will necessitate an expense to the Sanday Creek Company of $150,000 and to the New Pittsburgh Company of $50,000. The headquarters of both are at Columbus. All told throughout the districts named the outlay will run upward of $300,000. J.

CLEVELAND, O.—Plans were drawn some time ago for a building and bids accepted for a fireproof power plant at Scranton Road Hospital to cost $90,000. All the necessary apparatus will be purchased soon. R.

CLEVELAND, O.—The Parish & Bingham Company, makers of automobile frames, will build a power house to adjoin the new factory building. Switchboard and other apparatus will be purchased after the building is completed, but for the present will purchase its power. Later it will install the generators and necessary machinery to produce its own power. R.

IRONTON, O.—The local lighting company is preparing to extend its lines to Coal Grove, O., and to erect the necessary distribution system for the purpose of lighting the village and furnishing current for business and domestic purposes.

MILLERSBURG, O.—The Citizens' Light & Power Company has been organized with $35,000 capital stock.

WEST UNION, O.—Plans are being prepared for the construction of an electric light plant here. Address the city clerk for particulars.

ASHLAND, ILL.—Plans were prepared by the Abbott Light & Power Company for the construction of a substation at Ashland. Address R. H. Abbott, of Petersburg, president and manager.

BLOOMINGTON, ILL.—The B. and N. Railway & Light Company will expend $20,000 improving its plant.

HAVANA, ILL.—Plans are being prepared for the installation of a power plant which will be used only for the operation of an ornamental street lighting system. Address L. W. Ames, secretary.

JACKSONVILLE, ILL.—Mayor Davis has appointed a committee of the Council to make plans for a boulevard lighting system on several downtown streets. The movement has been taken up by several citizens. Z.

KANKAKEE, ILL.—A. N. Powers is promoting the Illinois Light & Power Company here. The company is to construct a dam and electric power plant at a place called the "Palisades," a few miles down the River from Kankakee and furnish current to nearby towns.

PANA, ILL.—Members of the City Council of Pana have agreed to sign a contract with the Central Illinois Public Service Company for a period of two years for lighting the streets. The price will be $60 a year for each light. The city also is to dismiss its injunction suit against the company and allow it to bring in a high tension wire from the power plant at Kinkaid, Ill. Z.

WINNEBAGO, ILL.—A movement has been started by C. W. Mellen for the installation of an electric lighting system for this village. Z.

DECATUR, MICH.—$15,000 will be expended for the construction of an electric light plant here. Address the city clerk for praticulars.

MARQUETTE, MICH.—The council will soon enlarge the Dead River power plant. Address Superintendent Retallic for further information.

PRAIRIE FARM, WIS.— A new electric lighting system will be installed here.

DORCHESTER, WIS.—A proposition is being discussed for an electric-lighting system consisting of about 900 to 1,000 lamps. Wells Electric Construction Company is interested.

BAGLEY, MINN.—J. F. Druar, consulting engineer, Commercial Building, St. Paul, is preparing plans for the reconstruction of the municipal electric light plant here.

LANSFORD, MINN.—The Commercial Club is planning to install an electric light plant here. C.

ALVORD, IOWA.—The citizens have voted to issue bonds for the construction of an electric light plant. Address the city clerk.

AURELIA, IOWA.—Business men here are circulating a petition to ask the Council for an appropriation for an electric light plant.

BUFFALO, IOWA.—A special meeting of the Buffalo City Council was called to discuss the matter of an electric-light plant. Address the secretary of the Board of Public Improvements.

DENISON, IOWA.—J. B. Hill, of Iowa City, is preparing plans for the construction of a municipal electric light plant here. Address J. B. Hill for information.

IOWA FALLS, IOWA.—The Iowa Railway & Light Company is planning to build a power plant for the purpose of supplying this city with electric light.

LORIMER, IOWA.—Gilbert Johnson, of Osceola, has been granted a franchise by the City Council to construct and operate an electric light plant at this place.

ROCK RAPIDS, IOWA.—The city will install electric lighting.

EXCELSIOR SPRINGS, MO.—The Excelsior Springs Water, Gas & Electric Light Company has applied for permission to issue $52,000 of six-per-cent twenty-year bonds for general improvement purposes. The value of the plant is fixed at $821,000. S. W. Henderson is vice-president of the company. M.

ST. JOSEPH, MO.—The City Council is considering plans for the enlargement and improvement of the municipal electric light plant here. Address W. E. Gorton, superintendent, for further particulars.

WESTBY, N. D.—An electric light plant will be established here. Address the city clerk.

PARKER, S. D.—J. F. Druar, engineer, Commercial Building, St. Paul has prepared plans for the installation of a municipal electric light plant here. Address the engineer for information.

NELIGH, NEB.—Plans have been prepared for the improvement and enlargement of the local electric light plant. Address J. Y. Spirk, engineer.

MINERAL, KANS.—Residents here and in other towns along the route of the Joplin & Pittsburgh Railway Company, are contemplating the erection of electric light and power plants.

SOUTH CENTRAL STATES.

WARSAW, KY.—The City Council, including Mayor B. S. Landram, is considering a proposition made by Lawrenceburg people to grant a franchise for electric street lighting, etc. A Council Committee has the proposition in hand. G.

ST. MARTINSVILLE, LA.—Plans are being considered for the installation of an electric light plant here. Address the city clerk.

BILLINGS, OKLA.—At a special election held recently, the proposition for the issue and sale of municipal bonds for the installing of waterworks and electric lighting was carried. The amount of $30,000 was voted, $23,000 to be used in procuring a water supply and $7,000 for installing a light plant.

FAIRLAND, OKLA.—The Fairland Light & Power Company will install a 60-horsepower boiler and 50-horsepower engine, also plans to install a 30-kilowatt generator and exciter.

OKEMAH, OKLA.—The Canadian Power & Light Company is planning to construct a hydroelectric plant to develop 2,000 horsepower on North Canadian River to cost $500,000.

HOUSTON, TEX.—The Texas Southern Electric Power Company has been organized here with a nominal capital stock of $1,000. The incorporators are Edwin B. Parker, Raymond Neilson and C. L. Carter. D.

WESTERN STATES.

WESTBROOK, MONT.—The Westbrook Electric Light & Power Company has been incorporated with a capital stock of $10,000 by J. Krueger, John E. Villa, and others.

WHITETAIL, MONT.—Plans are being discussed for an electric light plant here. W. S. Davis, of Assiniboine, Sask., is interested.

ANTONIO, COLO.—B. Desman, Salida, contemplates the construction of an electric light plant at this place, to cost $10,000.

HAILEY, IDAHO—The Hailey Electric Company will immediately extend its light and power lines to Ketchum and way points in order that that town may be furnished with current. O.

CARSON CITY, NEV.—Articles of incorporation have been filed here of the Canyon Power Company, a California corporation, which has an authorized capital stock of $1,000,000. The incorporators are Leon M. Grove, Charles Gross, J. E. Bowes, E. A. Herrmann and H. L. Breed of Oakland, Cal.

SANDY, ORE.—The Portland Railway, Light & Power Company, of Portland, has been granted a franchise by the City Council to supply current for both light and power to consumers in this city. The company will expend approximately $6,000 in constructing a power transmission line from Sandy to the Bull Run power plant and in erecting a transformer station. O.

BAKERSFIELD, CAL.—Bids will be received until August 8 for a 50-year franchise for an electric pole, tower and wire system in this city, applied for by C. H. L. Ghriest and C. H. L. Ghriest, Jr.

MOJAVE, CAL.—Mojave is to have a modern lighting system if the voters approve of the plan at the election called by the supervisors for July 28. C. H. L. Ghreist and his son have applied for a franchise to furnish electric lights and power for 50 years to the people residing within an area of three miles around the Southern Pacific depot at Mojave. Nothing is said in the application as to rates nor as to whom the petitioners represent. The franchise is to be sold August 8.

PROPOSALS.

INCANDESCENT LAMPS.—Bids will be received on July 31, for 3,000 or more 200-watt, 15 ampere, compensator-type gas-filled tungsten incandescent lamps. Address George D. Crowley, secretary, Board of Commissioners, Lincoln Park, Chicago, Ill.

ELECTRIC WORK.—Proposals will be received until July 30 for the electric work to be done on the building for male patients at Longview Hospital, Cincinnati, O. Elzner & Anderson, 136 Ingalls Building, this city, are the architects and have plans and specifications for the work. L.

LAMP STANDARDS.—Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., until July 31, for furnishing five electric lamp standards for the United States Bureau of Engraving and Printing, at Washington, D. C., in accordance with specification and drawing No. 282A.

INDUCTION MOTORS.—Sealed proposals will be received at the office of the Lighthouse Inspector, Third District, Tompkinsville, N. Y., until July 27 for furnishing two single-phase 2.5-horsepower alternating-current induction motors, 110 to 220 volts, 1,750 revolutions per minute, respectively, 60-cycle and 25-cycle. Further information can be supplied by the Inspector.

ELECTRIC-SIGNAL SYSTEM.—Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., until August 3 for an electric-signal system in the post office at Peoria, Ill., and for the same for the old subtreasury in San Francisco, Cal., in accordance with drawings and specifications, copies of which may be obtained from the Supervising Architect.

ELECTRICAL EQUIPMENT.—Bids will be received on July 30, by the clerk of the Sanitary District, Room 700, 910 S. Michigan Avenue, Chicago, Ill., for furnishing and installing electrical equipment in the Thirty-ninth Street pumping station, for furnishing and installing electrical equipment in the Terminal Station annex. Address Thomas A. Smyth, president of the Board of Trustees.

ELECTRICAL EQUIPMENT—Sealed proposals will be received at the office of the General Purchasing Officer, the Panama Canal, Washington, D. C., until August 3 for furnishing under Panama Circular 862 centrifugal pumps, cast-iron pipe fittings, Venturi meters, fuse panels, electric cable, galvanized conduit, etc. Blanks and general information can be obtained from any of the Assistant Purchasing Officers, who are located in all of the large cities of the United States.

POWER PLANT, ETC.—The Courthouse Building Commission has advertised for bids for the construction of the new courthouse, Cnicinnati, O., including the power plant, electrical equipment and elevators, which will be received until September 1. Rankin, Kellogg & Crane, 1012 Walnut Street, Philadelphia, are the architects. A fee of $10 to cover the cost of copies of plans and specifications is required to accompany each application and official blanks must be used by bidders in making proposals. L.

ELECTRIC FANS AND REWINDING ARMATURE.—Sealed proposals will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until August 4 for furnishing under Schedule 7,066 at the Navy Yard, Boston, Mass., one rewinding armature of 300 horse-power, Westinghouse, three-phase, 2,300 volts; and until August 1 for furnishing 15 alternating-current fans, single-phase induction, 12 inches, 110 volts, 60 cycles, under Schedule 7,057, for delivery at the Navy Yard, Brooklyn, N. Y.

ELECTRICAL EQUIPMENT.—Sealed bids will close July 28 for an ornamental lighting system, incandescent lamps, meters and transformers for the Electric Light Department of the city of Painesville, O. O. W. Kile, secretary of the department, and H. Whitford Jones, engineer, Cleveland, are giving out the specifications which call for: 100 40-watt multiple lamps; 50 60-candlepower street series lamps; 150 400-candlepower street series nitrogen-filled lamps; 42 600-candlepower series nitrogen-filled lamps; all electric meters needed from time to time for one year from August 1, in various quantities.

ELECTRICAL EQUIPMENT.—Sealed proposals will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until August 4 for the following electrical equipment, as per Schedule number indicated and for delivery at the Navy Yards named: three motors and three starters, 7030, Philadelphia, Pa.; 7,250 feet single-conductor stranded wire, 30,000 centimeters, 7024; Norfolk, Va.; 6,650 pounds weatherproof wire and 64,500 feet incandescent lamp cord, 2,580 centimeters, both 7053; also the annual supply of plugs, sparks and extra porcelains for same, annual supply of igniters and spark plugs for same, 7054; 3,200 feet rubber-insulated cotton-covered wire for ignition circuits and combustion engines, 312,000 feet silicon-bronze aerial wire, 1,022 centimeters, and 52,500 feet conductor, double, flexible, silk, all 7055; and one X-ray machine, transformer, interrupterless, 12 kilowatt, 220 volts, 7025, all of the above for delivery at the Navy Yard, Brooklyn, N. Y. The Bureau will also receive bids until August 18 for furnishing the following as per Schedule indicated and for delivery at the Navy Yard named: miscellaneous watt-hour meters, one 25-kilowatt direct-current engine-driven generating unit, both 7032; one electric whistle outfit, 125 volts, water-tight; one transmitter and four indicators, rudder angle, water-tight; and two transmitters, four indicators, shaft revolution, 7035, all for delivery at Navy Yard, Mare Island, Cal.

NEW INCORPORATIONS.

NAPLES, TEX.—Northeastern Electric Company has been incorporated with a capital stock of $15,000 by J. C. Martin, M. Galloway and J. P. Bedell.

BOSTON, MASS.—Lighting Supply Company has been incorporated with a capital stock of $200,000. The incorporators are George S. Eddy, Edwin W. Powell and Fred C. Thompson.

SEATTLE, WASH.—Ranier Electric Company has been incorporated with a capitalization of $3,000. The incorpor-

ators are C. R. Campbell, F. W. Rust, R. T. Evens and J. Henry Denning.

BLAIRSTOWN, N. J.—Blair Electric Light Company has been incorporated with a capital stock of $100,000 by W. H. Halt, New York City; John C. Sharpe, Blairstown; Henry C. Hunt, Sussex.

HOUSTON, TEX.—Texas Southern Electric Power Company has been incorporated here with a capitalization of $1,000. The incorporators are Edwin B. Parker, Raymond Neilson and C. L. Carter.

CHICAGO, ILL.—J. B. Hewitt & Company has been incorporated to do an electric contracting and engineering business. The capital stock is $10,000 and the incorporators are J. B. Hewitt. A. M. Newhouse and James H. Wright.

WARREN, O.—The United States Insulator Company has been incorporated with a capitalization of $450,000, to manufacture all kinds of insulators for use in electrical work, as well as other clay products. Michael Livingstone, A. B. Livingstone and others are interested.

NEW YORK, N. Y.—Okners' Electric Saving Company, Incorporated, has been granted articles of incorporation, capitalized at $5,000, to engage in the business of electrical contracting. The incorporators are Aaron Arnold, and Morris Rodgers, both of New York City.

SUNBURY, PA.—The Public Service Commission of Pennsylvania has announced that charters have been issued to the Turbotville Electric Company, the McEwensville Electric Company and the Lewis Township Electric Company, subsidiaries of the Northumberland County Gas & Electric Company, of Sunbury. The companies will have substations and will get their power from the main plant of the Northumberland company.

FOREIGN TRADE OPPORTUNITIES.

[Where addresses are omitted they may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., and at the branch offices of the Bureau, 315 Customhouse, New York, N. Y., 629 Federal Building, Chicago, Ill., Association of Commerce Building, New Orleans, La., and 310 Customhouse, San Francisco, Cal. Apply for addresses in letter form, giving file numbers.]

NO. 13,370. ELECTRIC MOTORS, FIXTURES, AND SPECIALTIES.—A business firm in Canada informs an American consular officer that it desires to be put in touch with American manufacturers of electric motors, fixtures, wiring appliances, pole line hardware, and specialties of all kinds.

NO. 13,379. ELECTRIC NOVELTIES AND HOUSEHOLD UTILITIES.—A business man in a European country informs an American consulate that he desires to import American novelties, particularly electrical novelties and all kinds of household utilities. He reports an active demand for such goods in the country in which he is located. Correspondence may be in English.

NO. 13,388. ELECTRIC TRAM CARS.—A municipality in the United Kingdom has applied for sanction to borrow $109,500 with which to purchase 25 electric tram cars. The extensions which have been made in the various car routes and the increased traffic will require the utilization in the near future of 50 to 75 new cars. About half of these will be built in the company's shops, and the remainder will be purchased. These cars will be of the "double-decker" type, inclosed both above and below. Interested American manufacturers should address the manager of the tramways.

NO. 13,390. ELECTRIC LIGHT AND TRAMWAY PLANT.—An American consular officer reports that the need of a new electric light plant for a city in his district has long been recognized. A contract has been signed for carrying out this work, and the contractor states that most of the material to be used in the undertaking will be imported from the United States. It is probable that an electric tramway will be installed.

FINANCIAL NOTES.

Plans of organization of the $25,000,000 Ohio State Telephone Company are nearing completion, and soon after August 11, the proposition will be submitted to the Ohio Public Utilities Commission. Fifteen independent companies are now said to be in the combination, which will be strengthened later by the addition of other properties. A joint meeting will be held August 11 to elect directors and officers.

To provide for funding back dividends on the $6,000,000 six-per-cent preferred stock of the Western Power Company, which will amount to 18 per cent on January 1, 1915, the directors of the company have drawn up a plan to incorporate, under the laws of New York, the Western Power Corporation, to have $7,080,000 preferred stock, with par value of $100 a share, and 146,700 shares of common stock without par value. One hundred and eighteen shares of the new preferred stock, which will become cumulative January 1, 1915, at the rate of six per cent per annum, will be exchanged for each 100 shares of the present preferred deposited. The new common will be exchanged share for share for the $14,670,000 common stock now outstanding.

Stockholders of the Columbus Railway, Power & Light Company will hold an adjourned meeting at Columbus on July 29 to take action on a proposition to increase the capital stock of the company from $11,550,000 to $15,145,000, and to vote on a proposed issue of bonds to be known as first and refunding sinking-fund mortgage five-per-cent gold bonds to an amount not exceeding $25,000,000, which will be secured by mortgage on the property of the company. The bonds will be issued from time to time to pay for extensions and improvements. The capital stock increase is designed to provide for the issuance of $3,145,000 prior-preference stock to retire a similar amount of first-consolidated-mortgage bonds of the Columbus Railway Company, which mature October 1, 1939; and for the issuance of $450,000 six-per-cent series A preferred stock with which to retire a similar amount of outstanding first-mortgage bonds of the Columbus Electric Company, maturing in November, 1922.

Dividends.

	Term.	Rate.	Payable.
Am. Ry. Co. pf.	Q	1.75%	August 15
Bangor Ry. & El.	—	0.5%	August 1
Binghamton Lt., Ht. & Pr. pf.	Q	1.5%	July 15
Binghamton Lt., Ht. & Pr. com.	Q	0.75%	July 15
Col. Ry. Pr. & Lt.	—	1.25%	August 1
Col. Ry. Pr. & Lt. pf. series B	Q	1.25%	August 1
East St. L. & Sub.	Q	1.25%	August 1
Lowell Elec. Lt.	Q	$2	August 1
Mont. Lt., Ht. & Pr.	Q	2.5%	August 15
North Amer.	Q	1.25%	October 1
Sayre Elec.	Q	1%	July 15
Sayre Elec. pf.	Q	1.5%	July 15
West Penn. Rys.	Q	1.25%	August 1

Reports of Earnings.

WESTERN UNION TELEGRAPH.

The Western Union Telegraph Company has issued its statement for the six months ended June 30, 1914 (June estimated), as follows:

	1914	1913
Total revenue	$22,222,900	$22,111,180
Maintenance and depreciation	4,015,900	4,589,179
Other expenses	15,518,000	15,328,010
Balance	2,689,000	2,193,991
Bond interest	668,625	668,625
Surplus	2,020,375	1,525,366

UTAH SECURITIES CORPORATION.
(Utah Power & Light and Subsidiary.)

	1914	1913
June gross	$ 176,056	$ 152,582
Net after taxes	100,328	97,285
12 months gross	1,959,141	1,645,055
Net after taxes	1,112,893	921,983

PACIFIC POWER & LIGHT.

	1914	1913
June gross	$ 113,594	$ 106,698
Net after taxes	59,921	54,748
Surplus after charges.	29,578	24,763
12 months gross	1,325,972	1,259,799
Net after taxes	691,531	590,725
Surplus after charges.	29,578	24,763
Balance after preferred dividends	81,886	45,113

KANSAS GAS & ELECTRIC.

	1914	1913
June gross	$ 78,604	$ 71,540
Net after taxes	28,034	27,453
Surplus after charges.	12,898	13,172
12 months gross	1,104,343	953,216
Net after taxes	401,425	329,300
Surplus after charges.	223,818	161,716
Balance after preferred dividends	118,818	56,716

LEWISTON, AUGUSTA & WATERVILLE STREET RAILWAY.

	1914	1913.
May gross	$ 58,572	$ 54,123
Net after taxes	21,182	20,715
Surplus after charges	5,522	6,056
Twelve months' gross	679,179	645,783
Net after charges	223,244	250,485
Surplus after charges	39,128	76,764
Balance after preferred dividends	3,128	40,764

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	July 20	July 13
American Tel. & Tel. (New York)	118⅞	118½
Commonwealth Edison (Chicago)	136	136⅛
Edison Electric Illuminating (Boston)	249½	249½
Electric Storage Battery preferred (Philadelphia)	50¾	51
Electric Storage Battery preferred (Philadelphia)	50¾	51
General Electric (New York)	147½	148
Kings County Electric (New York)	119	120
Massachusetts Electric common (Boston)	10	10¼
Massachusetts Electric preferred (Boston)	58	58
National Carbon common (Chicago)	116½	117
National Carbon preferred (Chicago)	120¾	120¾
New England Telephone (Boston)	130	130
Philadelphia Electric (Philadelphia)	24⅞	25⅛
Postal Telegraph and Cables common (New York)	80⅝	79½
Postal Telegraph and Cables preferred (New York)	67	68
Western Union (New York)	58	59¼
Westinghouse common (New York)	77½	78
Westinghouse preferred (New York)	122	122

PERSONAL MENTION.

MR. G. R. GRIEVE has been appointed chief correspondent for the local office of the Westinghouse Electric & Manufacturing Company, at Salt Lake City.

MR. W. C. WURTBEL, district manager of the Westinghouse Lamp Company with headquarters at Salt Lake City, has been spending the past week with his family at Vivian Park Forks, Provo Canyon.

MR. R. J. MONROE has been appointed district representative of the General Motor Truck Company with headquarters at Denver, Colo., succeeding DR. MELCHER EKSTROMER, who has been transferred to St. Louis.

MR. L. WOOD DAVIS, district representative of the Westinghouse Lamp Company for the states of Montana and Washington, with headquarters at Butte, Mont., is spending his vacation in Salt Lake City visiting with his mother.

MR. R. H. WINTERS, head of the Winters Electric Company, Toledo, O., is spending his vacation with his family at Michigan lakes. Mr. Winters believing that a vacation should represent a real rest took no one into his confidence as to the exact spot of his sojourn, but assured everybody that there would be fish enough to go 'round upon his return.

MR. CHARLES UNDERHILL, chief electrical engineer of the Acme Wire Company, New Haven. Conn., delivered a lecture on "Electromagnets" before the student officers of the Naval Post Graduate School, at the United States Naval Academy, Annapolis, Md., on July 15. A number of officers and instructors attended the lecture, which was illustrated by numerous slides and actual electromagnets of various forms.

MR. THEODORE RICE, of New York City, has been appointed business manager and electrician for the Northern Power Company, of Potsdam, N. Y., to assist MR. A. A. POTTER, local manager, who has represented the company in Potsdam for many years. The business of the company has considerably increased, and the present offices are to be greatly enlarged.

MR. F. E. AUSTIN, during the past six years head of the department of electrical engineering at Norwich University, has resigned to engage in engineering education extension work and the publication of several engineering books. During the present summer, Professor Austin has charge of special classes in electrical engineering at the Thayer School of Engineering, Dartmouth College.

MR. FREDERICK O. BALL has announced his resignation as general manager of the American Engine & Electric Company, of Bound Brook, N. J. Mr. Ball will engage in the manufacture and sale of carburetors with his father, MR. FRANK H. BALL, who retired from the engine business last year. The carburetor business will be conducted under the firm name of Ball & Ball, with headquarters in Detroit, Mich.

MR. HERBERT O. PHILLIPS and Mrs. Mary M. Berry were married on Thursday, July 16, at Providence, R. I. They will make their home, after October 1, at 48 Underwood Street, Pawtucket, R. I. H. O. Phillips is one of the well known men of the electrical industry. He is treasurer of the Phillips Insulated Wire Company, and a host of friends and acquaintances will wish for Mr. and Mrs. Phillips a long life of happiness and prosperity.

MR. CASSIUS M. BARNES has been appointed manager of the Emporia (Kans.) branch of the Postal Telegraph Company. Mr. Barnes was formerly Governor of Oklahoma, holding that office from 1897 to 1901 under President McKinley. He began his business career as a telegrapher, his recent appointment therefore being an appropriate one. After giving up the governorship, he was mayor of Guthrie, Okla., for three terms.

MR. HARRY H. HORNSBY has resigned his position as conduit and supply sales manager of the Sprague Electric Works. He will announce his future plans in the Autumn. Mr. Hornsby has for many years been one of the most popular and successful salesmen of electrical conduit in the business. He has a host of friends among the electrical supply jobbers, contractors, inspectors, and engineers, and announces his gratitude to them for their many expressions of good will during the past 10 years. Mr. Hornsby's present address is 965 Boulevard, East, Weehawken, N. J.

OBITUARY.

MR. WILLIAM BLEECKER POTTER, founder and manager of the St. Louis Sampling and Testing Works, and one of the best known mining engineers and metallurgists in the United States, died at his home at St. Louis on the morning of July 14. He was 68 years old.

NEW PUBLICATIONS.

REGULATION OF PUBLIC UTILITIES.—The address made by William D. Kerr, director of the Bureau of Public Service Economics, on May 4, before the Finance Forum of the West Side Young Men's Christian Association, New York City, entitled "Future Regulation of Public Utilities" has been published in pamphlet form.

PERMISSIBLE ELECTRIC LAMPS FOR MINERS.—The Bureau of Mines has issued Technical Paper No. 75 with the foregoing title. This has been prepared by H. H. Clark and gives first a brief review of the subject of electric lamps for mining use. A summary is given of the tests for determining which types of lamps shall be declared permissible in gaseous mines. The three lamps approved are described in detail. There is also given a general discussion of qualities other than safety which should be possessed by a portable electric lamp for this service.

ROSTER OF THE JOVIAN ORDER.—The Jovian Order has published a roster including complete data from the organization, May 20, 1899, to rejuvenation No. 448, December, 1913. A complete alphabetical list of all members up to and including Potential 12,282, is given. There is also some very interesting information respecting the mythological basis and plan of the order, a directory of the past Jupiters' Association and Constellations, and the Constitution and By-Laws. The publication is so extensive in character that it could not be produced for general distribution free. It should, however, be in the hands of every Jovian, and Mercury Ell C. Bennett, Syndicate Trust Building, St. Louis, Mo., will be pleased to send copies to those requesting them at the low price of $2.00 each.

DATES AHEAD.

Southeastern Section, National Electric Light Association. Annual convention, Isle of Palms, Charleston, S. C., August 19-21. Secretary, A. A. Wilbur, Columbus, Ga.

American Peat Society. Annual meeting, Duluth, Minn., August 20-22. Secretary, Julius Bordello, 17 Battery Place, New York, N. Y.

New England Section, National Electric Light Association. Sixth annual convention, Narragansett Pier, R. I., September 2-4. Secretary, Miss O. A. Bursiel, 149 Tremont Street, Boston, Mass.

Pennsylvania Electric Association. Annual convention, Eagles Mere, Pa., September 8-11. Secretary, S. E. Pohe, Bloomsburg, Pa.

American Institute of Electrical Engineers. Pacific Coast convention, Spokane, Wash., September 9-11. Secretary, F. L. Hutchinson, 29 West Thirty-ninth Street, New York, N. Y.

Electrical Supply Jobbers' Association. Regular quarterly meeting, Clifton Hotel, Niagara Falls, Canada, September 9-11. General secretary, Franklin Overbagh, 411 South Clinton Street, Chicago.

Association of Edison Illuminating Companies. Annual convention, White Sulphur Springs, W. Va., September 14-17. Secretary, George C. Holberton, San Francisco, Cal.

Association of Iron and Steel Electrical Engineers. Annual convention, Cleveland, O., September 14-19. Secretary, W. T. Snyder, McKeesport, Pa.

Old-Time Telegraphers' and Historical Association and Society of the United States Military Telegraph Corps. Thirty-third annual reunion, Kansas City, Mo., September 15-17. Secretary of Old-Timers, F. J. Scherrer, 30 Church street, New York. Secretary, Military Telegraph Corps. David Homer Bates, 658 Broadway, New York.

International Association of Municipal Electricians. Annual convention, Atlantic City, N. J., September 15-18. Secretary, C. R. George, Houston, Tex.

Illuminating Engineering Society. Annual convention, Cleveland, O., September 21-25. Secretary, Joseph D. Israel, 1000 Chestnut Street, Philadelphia, Pa.

American Electrochemical Society. Twenty-sixth general meeting, Niagara Falls, N. Y., October 1-3. Secretary Joseph W. Richards, South Bethlehem, Pa.

American Electric Railway Association. Annual convention, Atlantic City, N. J., October 12-16. Secretary, E. B. Burritt, 29 West Thirty-ninth Street, New York, N. Y.

Jovian Order. Annual congress, St. Louis, Mo., October 14-16. Mercury, Ell C. Bennett, Syndicate Trust Building, St. Louis, Mo.

Electric Vehicle Association of America. Fifth annual convention, Philadelphia, Pa., October 19-21. Secretary, A. J. Marshall, 29 West Thirty-ninth Street, New York, N. Y.

Telephone Pioneers of America. Annual reunion, Richmond, Va., October 29-30. Secretary, Henry W. Pope, New York City.

With the Electrical Manufacturers

Gamewell Fire-Alarm Telegraph Company has moved its main offices to suite No. 5,708 Grand Central Terminal, New York City.

The Electric Storage Battery Company, Philadelphia, Pa., has issued a supplemental price list to Section A of its general catalog. This deals with Chloride Accumulators for fire-alarm, signal, telegraph, telephone, and automatic time-clock circuits. These are of either the couple or two-plate type, or of the multiple-plate type and usually mounted in glass cells on sand trays.

Electric Specialty Company, Stamford, Conn., has issued Bulletin 201 describing its self-starting alternating-current motors. These are of a special split-phase, squirrel-cage, induction type made in sizes from one-tenth to one-third horsepower. They are of high-grade construction so as to give the highest reliability and excellent performance. The bulletin has numerous illustrations, dimension diagrams and tables of data.

Sprague Electric Works of General Electric Company has issued bulletin No. 48,901. This is devoted to electric winches and winding drums, the former being usually of the vertical type with the motor entirely inclosed within the base. The bulletin has many illustrations of the machines themselves and installations in which they have been employed. Dimension diagrams and full data are given of the various types.

Siemens & Halske and the **Siemens-Schuckertwerke,** Berlin, Germany, in the twelfth number of their monthly *Mitteilungen,* have some very interesting articles, of which one is an illustrated description of elevated and underground rapid-transit railway systems which have been installed by the Siemens & Halske Atkien-Gesellschaft. Another article describes regulating equipment for arc lamps. Still another article deals with illumination systems using the new half-watt lamps.

Sangamo Electric Company, Springfield, O., has issued bulletin No. 37 on mercury-type direct-current watt-hour meters. This is a very attractively prepared 32-page publication with a large number of illustrations showing detail parts and various general views and diagrams of these meters. Each part of the instrument is described in great detail. These meters are made now not only in the two-wire but also in the three-wire type, the latter being a new development of the company. This new type is known as the D-5.

The Bristol Company, Waterbury, Conn., announces the establishment of a district branch office at Boston, in charge of F. H. Emerson. This year is the twenty-fifth anniversary of the founding of the Bristol Company. The plant has grown at the rate of doubling the floor space once every five years during the entire period. The growth of the business has been especially large during the last six years, since 1908, when the president of the company, William H. Bristol, again took up the general management of the organization.

The Pittsburgh Transformer Company, Pittsburgh, Pa., has published as Bulletin No. 1338 a reprint of an article published by H. P. Taylor & Company, a well known New York bond house, relating to the great future of the electrical industry. This article sets forth the reasons why the electrical industry is destined to have a future even more remarkable than the developments which have taken place in the past. The Pittsburgh Transformer Company believes that the material will be of substantial interest to electrical men and will be pleased to furnish those interested with a copy upon request.

Allgemeine Elektricitäts-Gesellschaft, Berlin, Germany, has recently added quite a number to its long list of publications. One of these describes iron-clad installation materials for railway workshops; included in this are switches of various types, iron cutout boxes, junction boxes, etc. Another publication describes electrical pump installations in the waterworks at the Spieser-Mühlenthal mine. Another pamphlet deals with motor-driven pumping installations for supplying water for houses in which automatic control is desired. Another publication deals with potential regulators, while another deals with graphic curve-drawing instruments.

Stow Manufacturing Company, Binghamton, N. Y., has issued catalog No. 14 which covers 96 pages of very completely illustrated descriptions of its many products. The first portion of the book is devoted to Stow flexible shafts and various drills, grinders and other tools which may readily be driven thereby. The Stow multiple-speed motors are described, together with various stationary and portable tools directly driven thereby; a large number of light portable tools, such as buffers, grinders, drills, etc., electrically driven either with or without the flexible shaft are also described. Flexible boring machines of the radial type are also taken up.

Otis Elevator Company, New York City, has issued a publication entitled "Catching the Eye of the Public." This describes the window display which the company has prepared for loaning to central-station companies in the effort to familiarize the public with the use of electric elevators in the most modern buildings. The company has also issued a folder giving diagrams to show the increasing use of Otis elevators since the year 1900. There are now in operation in the United States nearly 40,000 elevators of this type, representing a load of about 525,000 horsepower. These diagrams show forcibly the value of electric elevators as a central-station load.

Dayton Engineering & Laboratories Company, Dayton, O., which manufactures the well known Delco electric ignition, lighting and starting system for automobiles, is erecting an immense building at First and Madison Streets for its use, its rapidly increasing business necessitating immediate expansion. Although it recently acquired the building vacated by the Pinneo & Daniels Company, to enlarge its own factory, still more room was found necessary, and the new building is the result of this growth.

The Davis Slate & Manufacturing Company, 608 East Fortieth Street, Chicago, Ill., has ready for distribution a complete price list of electrical slate for switchboards, panels, bases, etc.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has added to its publications what is known as Ad Leaflet No. 103, which gives an illustrated description of the show-window cutout of a young girl demonstrating electrical appliances. This is the well known figure designated by the company as Dorothy. The cutout is lithographed in six colors and can be very effectively used with the display of any heating device or fan. Copies are furnished for a limited time to appliance dealers. The company has also issued descriptive leaflet No. 3723, which is devoted to Baldwin-Westinghouse industrial locomotives; illustrations of typical installations are shown and briefly described.

The Pyrene Manufacturing Company, 1358 Broadway, New York, has published a very interesting booklet entitled "The Vital Five Minutes." This booklet indicates the great possibilities and actual results accomplished by anticipating the fire loss through preventative measures. An interesting development of the Pyrene extinguisher is the rather common practice nowadays of carrying Pyrene fire extinguishers on motor cars. This not only reduces automobile fire losses, but has been found, upon a number of occasions, to bring prompt and efficient relief in the case of emergency of an outlying fire not easily reached by the ordinary fire fighting apparatus. As a matter of fact, several up-to-date manufacturers are standardizing the Pyrene extinguisher as part of the car's equipment, and it is stated that this is also a matter of economy, because of the leading insurance companies' allowing a preferential rate, amounting to something like a saving of 15 per cent, for cars equipped with the Pyrene extinguisher.

Record of Electrical Patents.

Issued by the United States Patent Office, July 14, 1914.

1,103,027. Motor Control. B. Borland, Chicago, Ill. Includes an electric interlock.

1,103,040. Automatic Switch for Telephone Systems. A. H. Dyson, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Electromagnetic control for the wipers.

1,103,041. Multiweld Secondary. E. Fulda, New York, N. Y. The secondary terminal bars extend parallel to one another but in opposite directions and have several pairs of electrodes between them. (See cut).

1,103,052. Signal. J. Kertesz, Woodbridge, N. J. Electrically lighted direction pointers.

1,103,056. Line or Cable Clamp. F. P. Kobert, assignor to Barnes & Kobert Mfg. Co., New Haven, Conn. Trough-shaped body with a clamping bolt extending through the bottom plate.

1,103,060. Method and Means for Fixing Nitrogen. W. S. Landis, assignor to American Cyanamid Co., Nashville, Tenn. Electric resistance-furnace process starting with a charge of calcium carbide, to which is fed atmospheric nitrogen.

1,103,061. Process and Apparatus for Fixing Atmospheric Nitrogen. W. S. Landis, assignor to American Cyanamid Co. A number of resistors are buried directly in the charge and raised to the temperature necessary to bring about the desired reaction.

1,103,062. Method of and Apparatus for Fixing Nitrogen. W. S. Landis, assignor to American Cyanamid Co. Modification of the above.

1,103,073. Emergency Signaling System for Telephone Toll-Collecting Apparatus. J. J. O'Connell, assignor to American Telephone & Telegraph Co. For prepayment coin telephone.

1,103,079. Coil Cases for Insertion in Cables. F. L. Rhodes, assignor to American Telephone & Telegraph Co. For Pupin coils in lead-covered and armored telephone cables.

1,103,122. Electric Holder. L. W. Andersen, assignor to Plume & Atwood Mfg. Co., Waterbury, Conn. A separable shell forming a socket holder has arms extended to hold an inverted shade. (See cut).

1,103,130. Connection for Coil Cases and Cables. J. Cunningham and W. H. Horner, assignors to American Telephone & Telegraph Co. Modification of No. 1,103,079.

1,103,133. Printing-Telegraph Receiver. A. F. Dixon, assignor to Western Electric Co. Includes a current distributer, magnets in its circuits, several pivoted disks, a rotary type shaft, levers selectively controlled by the position of the disks and a release magnet.

1,103,143. Web-Tension Controlling Mechanism. I. A. Hunting, assignor to W. S. Morse, Philadelphia, Pa. Includes electrically operated mechanism to actuate the retarding devices.

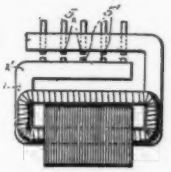
1,103,152. Tension Regulator for Printing Presses. W. S. Morse, Philadelphia, Pa. Electrically actuated brake.

1,103,171. Sealing Plug for Electrical Water Heaters. R. A. Bower, assignor to Sales Co., San Francisco, Cal. For separating the water compartment from the switch box.

1,103,181. Braiding Machine. W. E. Elliott, Grand Rapids, Mich. Includes rotating electromagnets arranged to attract and hold the bobbin carriers.

1,103,187. Sparking Plug. B. T. Ferguson and R. F. Fenton, Standard, La. Has several electrodes mounted in staggered relation in the lower end of the core.

1,103,192. Rotary Converter. Valere Alfred Flynn, London, England. A



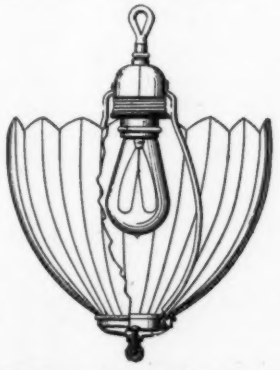
1,103,041.—Multiweld Secondary.

method of adjusting the ratio between the A. C. and D. C. voltages consists in varying the axis of the exciting field relatively to the brush axis and simultaneously varying the strength of the neutralizing field.

1,103,199. Switch. G. W. Hart, assignor to Hart Mfg. Co., Hartford, Conn. Remote-controlled solenoid-actuated switch.

1,103,206. Divided Semi-Automatic Signal Lever. W. K. Howe, assignor to General Railway Signal Co., Gates, N. Y. Electromagnetically locked.

1,103,220. Coupling for Electrical Conduits. A. C. Proudfit, Princeton, N. J. Consists of a shank with several sepa-



1,103,122.—Socket and Shade Holder.

rated compressable fingers and a cam locking nut.

1,103,233. Safety Appliance for Air-Craft. E. L. Waight, San Francisco, Cal. A parachute has an explosion chamber and electrical means for exploding cartridges therein.

1,103,244. Separable Attachment Plug. E. G. K. Anderson, assignor to Benjamin Electric Mfg. Co., Chicago, Ill. Includes a spring plunger for the middle contact.

1,103,250 and 1,103,251. Separable Attachment Plug. R. B. Benjamin, assignor to Benjamin Electric Mfg. Co. The two parts are released on a direct pull and when they are rotated relatively to each other.

1,103,252. Reflector Shade. R. B. Benjamin, assignor to Benjamin Electric Mfg. Co. A street-lamp reflector with partial paraboloids in the direction of the streets.

1,103,274. Electric Heater. H. W. Denhard, assignor, to Cutler-Hammer Mfg. Co., Milwaukee, Wis. Circulating water heater with tubular electrodes.

1,103,285. Electrical Insulating Compound. T. J. Hadley, Winnipeg, Man., Canada. Consists of coal tar eight gallons, kerosene oil two gallons, Portland cement two gallons and Japan drier one gallon.

1,103,288. Selective Signaling System. R. N. Hill, assignor to Western Electric Co. For telephone train dispatching interconnected with semaphore block signals.

1,103,294. Electric Sign. L. H. Jones and L. M. Jones, Wichita, Kans. Includes a keyboard with many closely grouped switches connected to corresponding lamps and a removable form for depressing groups of switches to form any desired character.

1,103,309. Electric Furnace. A. Minet and H. L. Lucas, Paris, France. Has a principal carbon resistor and a secondary resistor formed of hollow blocks.

1,103,353. Electric Heater. G. Egly, assignor to Gebrueder Siemens & Co., Berlin, Germany. Composed of a non-metallic refractory resistance material provided with a metallic terminal coating glazed with a compound of boron.

1,103,358. Method of and Apparatus for Tempering Iron and Steel Articles. H. Hess, Philadelphia, Pa. Steel balls improperly heated are electromagnetically attracted away from the tempering bath.

1,103,379. Method of Generating Heat By Means of Electric Arcs. I. Rennerfelt, Stockholm, Sweden. Consists in passing two-phase currents between two opposed electrodes to the end of a third electrode at right angles to and between them.

1,103,382. Combined Sintering and Stretching Process. K. R. R. Seifert, Charlottenburg, Germany. Consists in passing a current through the tungsten to sinter it and in stretching the metal by passing it through a die while the current is on.

1,103,385. Electrical System. R. Varley, Englewood, N. J. Ignition system for automobiles.

1,103,405. Automatic Reversing Switch. A. H. Fox, New York, and A. W. Lenderoth, Stapleton, N. Y. Operated by a reversible axle and automatic clutches.

1,103,411. Fuse Plug. J. H. Hanson and J. W. Steele, Chicago, Ill. An Edison plug with several fuses.

1,103,412. Snap Switch. G. W. Hart, asignor to Hart Mfg. Co., Hartford, Conn. Push-button wall switch.

1,103,421. Cable Telegraphy. I. Kitsee, assignor to American Telephone & Telegraph Co. A reverse-current system.

1,103,499. Process of Regenerating Oil Used for Electrical Purposes. R. Friese, assignor to Siemens-Schuckertwerke, G. M. B. H., Berlin, Germany. Oil treated with acetone.

1,103,501. Multiphase Electric Motor. H. Gearing, Los Angeles, Cal., assignor of one-fourth to C. J. O'Neill and one-fourth to G. P. Ritter. Means for connecting stator windings in Y, delta or combination of both.

1,103,504. Socket Cap. J. H. Goss, assignor to Scovill Mfg. Co., Waterbury, Conn. For an electric-light socket.

1,103,511. Switch. W. S. Harlow, Swampscott, Mass. An inclosed service-entrance switch.

1,103,525. Electric Switch and Lock Box Therefor. D. S. McKenna, San Francisco, Cal. A key locked switch, the cap of which can only be removed when handle is at neutral.

1,103,528. Current Controlling Apparatus. W. S. Morse, Philadelphia, Pa. An automatic motor reversing switch.

1,103,529. Electric Switch. C. C. Newburn, assignor to Frank B. Cook Co., Chicago, Ill. A plug switch.

1,103,530. Electromagnet. C. C. Newburn, assignor to Frank B. Cook Co. An electric bell-magnet structure.

1,103,533. Electric-Socket Plug. E. B. Nilson, assignor to Chi-Ill-Electric Co., Chicago, Ill. Both wires carried inside socket. (See cut.)

1,103,544. Electrical Binding Screw or Terminal. S. Smith, Detroit, Mich. Wire for screw and center contact pass through base. (See cut.)

1,103,544. Electrical Binding Screw or Terminal. S. Smith, Detroit, Mich. Designed to receive two conductors.

1,103,572. Automatic Telephone System. B. G. Dunham, Urbana, O., assignor to Western Electric Co. When desired line is busy, connection is made automatically when line ceases to be busy.

1,103,583. Selective Signaling System. R. N. Hill, assignor to Western Electric Co. For telephones.

1,103,585. Glass-Drawing Apparatus. H. F. Hitner, assignor to Pittsburgh Plate Glass Co., Pittsburgh, Pa. A generator and motor combination driving glass-drawing machinery.

1,103,590. Expression-Controlling Means for Musical Instruments. J. F. Kelly, Pittsfield, Mass. Varying voltage of electrically operated instrument gives desired effect.

1,103,605. Device for Illuminating Thermometers and Similar Instruments. M. E. Moeller, New York, N. Y. Miniature lamp placed in receptacle at top of stem.

1,103,623. Multiple Brush Selector. J. N. Reynolds, assignor to Western Electric Co. An idler pulley arrangement.

1,103,624. Moving Display Device. E. H. Richardson, assignor to Hotpoint Electric Heating Co., Ontario, Cal. A moving display for electric heaters.

1,103,626. Electric Elevator. R. G. Sanford, Yonkers, N. Y. Means for connecting resistance in series with motor in starting and in parallel when stopping.

1,103,640. Thermo-Electric Pyrometer. C. H. Wilson, Mount Vernon, N. Y. A thermo-couple and voltmeter.

1,103,650. Telephone Coin Register. W. O. Beck, Ridgefield, N. J., assignor to Western Electric Co. Has electromagnetic controlling means and actuator.

1,103,657. Electrical Circuit Controller. Vernon Cano, A. A. Cano, and L. Cano, New York, N. Y. A tongue-operated circuit controller.

1,103,662. Automatic Starting Box. M. E. Custer, Carbonado, Wash. A solenoid starter.

1,103,669. Electric Massage Instrument. J. E. Gibbs, assignor of one-half to Wm. A. Byerly, Bridgewater, Va. Covers details.

1,103,672. Electric Starting and Generating Mechanism for Vehicles. J. A. Heany, assignor to A. E. L. Leckie, Washington, D. C. A worm-geared motor for starting internal combustion engines.

1,103,688. Electric Relay. W. L. Richards, assignor to Western Electric Co. An evacuated-vessel electric relay with heated electrode.

1,103,690. Electrically Heated Instrument. G. J. Schneider, Detroit, Mich., assignor to Acme Electric Heater Co., Detroit, Mich. Covers details of mechanical construction.

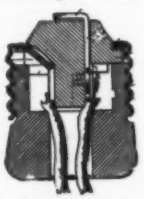
1,103,693. Electric Circuit and Motor. H. M. Shed, assignor to David A. Marks, New York, N. Y. A series motor with secondary winding varying resistance of motor.

1,103,748. Electric Fitting for Circuit Wiring. M. F. Finkelstein, New York, N. Y. A clamp connector.

1,103,749. Electrical Fitting. M. F. Finkelstein, New York, N. Y. A modification of 1,103,748.

1,103,760. Chain Attachment. G. W. Goodridge, assignor to The Bryant Electric Co., Bridgeport, Conn. For lengthening socket chains.

1,103,777. Multiple Fuse Plug. A. J. Kalinowski, Lyons, Col. A sectionalized plug fuse.



1,103,533.—Electric Socket Plug.

1,103,797. Spark Plug. E. McFarland and E. C. Churning, Sausalito, Cal. A jump-spark plug.

1,103,822. High Tension Oscillator. W. Otto, Berlin, Germany. An inclosed plate oscillator.

1,103,835. High-Tension Current System. R. Raines, New York, N. Y. A rotary circuit interrupter.

1,103,860. Signaling Device. G. L. Barrett, Springfield, O. A bell signal operated by passage of trolley wheel over trolley wire.

1,103,883. Door Contact Switch. A. Kielblock and H. Dittmann, Arnstadt, Germany. A rotary contact switch.

1,103,905. Outlet Box. H. C. Mills, Unionville, Conn. For old lath and plaster work.

1,103,909. Telephone Signaling System. F. R. Parker, Chicago, Ill. A lamp signaling system.

1,103,916. Electric Make-and-Break Device. G. E. Lawrence, assignor to Hydro Mfg. Co., Philadelphia, Pa. A chain-driven rotating contact device.

Patents Expired.

The following United States electrical patents expired July 20, 1914.

586,539. Telephone Attachment. W. W. Beck, Sebastopol, Cal.

586,543. Connection for Electric Switches. H. A. Bullard, Pittsfield, Mass.

586,554. Flexibly Insulated Conductor. J. H. Kelman, Pittsfield, Mass.

586,559. Electrical Meter. W. D. Marks, Philadelphia, Pa.

586,560. Electric Meter. W. D. Marks and G. R. Green, Philadelphia, Pa.

586,565. Fusible Cutoff. C. G. Perkins and J. Tregoning, Hartford, Conn.

586,575. Lightning Arrester for Switchboards. A. M. Taylor, Niles, Mich.

586,578. Electrically Operated Railway Barrier. C. C. Van Der Valk, Haarlem, Netherlands.

586,602. Conduit Electric Railway. W. E. M. Jackson, Indianapolis, Ind.

586,606. Circuit Controller for Electric Vehicles. K. Kundsen, Chicago, Ill.

586,615. Electric Heater. J. F. McElroy, Albany, N. Y.

586,622. Induction Coil for Medical Apparatus. H. C. Porter, Chicago, Ill.

586,627. Active Material for Secondary Battery Plates. S. A. Rosenthal, London, England.

586,643. Purifying Water by Alternating Electric Currents. E. Verstraete, St. Louis, Mo.

586,647. Trolley. W. Willett, Johnstown, Pa.

586,652. Apparatus for Working Electric Tramways. C. Anderson, Leeds, England.

586,665. Connector for Electrical Conducting Wires. S. P. Hull, Poughkeepsie, and J. Du Bois, Albany, N. Y.

586,679. Combined Syringe and Electrical Apparatus. L. G. Woolley, Grand Rapids, Mich.

586,685. Telephone Switchboard. H. V. Hayes, Cambridge, Mass.

586,686 and 586,687. Electric Furnace. R. F. S. Heath, Camden, N. J.

586,700. Electric Line Insulator. J. J. Tracy, Hartford, Conn.

586,702. Electrically Actuated Switch Mechanism. W. S. Browne, Brooklyn, N. Y.

586,723. Excessive Current Recorder. J. R. Cravath, Chicago, Ill.

586,755. Telegraph Cable. J. M. Barr, London, England.

586,774. Dash Electric Headlight. J. Kirby, Jr., Dayton, O.

586,793. Telephone Attachment. S. C. Houghton, San Francisco, Cal.

586,811. Electrical Conductor. C. M. Dutton, New York, N. Y.

586,813. Electrical Gas Alarm. J. Erikson, Providence, R. I.

586,822. Electric Furnace. F. J. Patten, New York, N. Y.

586,823. Electromagneto Motor. F. J. Patten.

586,824. Electric Furnace. F. J. Patten.

586,825. Electric Motor. F. A. Perret, Brooklyn, N. Y.

586,845. Electromagnetic Third Rail System. W. Grunow, Jr., Bridgeport, Conn.

586,852. Underground System for Electric Railways. A. S. Krotz, Springfield, O., and A. W. P. Allen, Chicago, Ill.

586,861. Electrically Operated Valve. F. McDonald, Portland, Me.

586,888. Telephone Signaling Relay. A. S. Williams, Newton, Mass.

586,891. Electrical Signaling Apparatus. A. W. Anderson, Altoona, Pa.

586,894. Electrodepositing Device. J. Bossard, Dubuque, Iowa.

586,920. Electric Railway System. H. P. Wellman, Ashland, Ky.

586,933. Electric Switch. J. F. McElroy, Albany, N. Y.